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Guest Editorial

Reshaping ACRL

Like all good membership organizations, ACRL used some of its energies in the 1980s to develop a mission statement, goals, and objectives and to form a five-year strategic plan, focusing on both the needs of the membership and the critical issues of the times. This plan, implemented in 1987, was not replaced immediately by a successor in 1992. Rather the leadership of the association has been working to carefully study ACRL's membership needs, and the changes in the environment within which we operate, to restate the ACRL mission, and to identify a vision and set goals for the organization.

At the recent American Library Association (ALA) Midwinter Meeting in Philadelphia, a new mission statement, vision, and goals were presented in draft form to the ACRL Board by the Interim Planning Committee. With the suggestions from that discussion, the committee will continue its work at the National Conference in Pittsburgh, and expects to present a completed set of statements to the Board of Directors for ratification at the Annual Conference in June.

Because this process and its results are so important for the membership of ACRL, I want to describe briefly the level of involvement of the membership, the techniques that have been used to gather information and feedback from ACRL members and leaders, and to give you a sense of the documents as they currently stand.

For an afternoon prior to each conference of the ALA, since Midwinter 1993, ACRL has held a Leadership Planning Session. The participants at these meetings are the Board of Directors, the elected officers of sections, divisional committee chairs, Chapters' Council chair and vice-chair, Budget and Finance Committee members, and Planning Committee members. In addition to responding to the membership survey of 1992 (a sample—not the entire membership—was surveyed), these sessions have identified key ACRL values, opportunities, and threats; they have focused on issues of communication, member services, and the role of ACRL in the national higher education community; they have identified diversity and the "graying of academic librarianship" as human resources issues of concern to the association on behalf of its membership.

In September 1994 an Interim Planning Committee was formed, composed of the ACRL Planning Committee and the Executive Committee of the board. This group has worked diligently to mold the output from the Leadership Planning Sessions into series of documents that will reshape and guide ACRL for the coming five years.

The draft mission statement as currently conceived is: "The mission of the Association of College and Research Libraries is to provide leadership for development, promotion and improvement of academic and research library services in order to enhance learning, research, scholarship and service. The Association strives to promote the highest level of professional excellence for librarians in order to serve the users of academic and research libraries." The two-pronged focus on library services and librarians is deliberate, and the vision and goals follow from this mission in a logical sequence.

Key to the successful implementation of the new plan is a change in the way

the Board of Directors operates. A task force of the board, under the leadership of former president Jacqueline McCoy, recommended less micromanagement of association affairs, and more emphasis on "big-picture," policy, and strategic areas. The board has embraced this recommendation, and has agreed that its role in the ongoing planning process is to:

- Set overall direction and communicate that direction to the association;
- Assure that the plan is effective;
- Keep ownership of the plan;
- Assure alignment of overall and unit planning;
- Develop or reevaluate mission, vision, values, strategic areas, and goals; and
- Develop priorities for the coming year.

The operating arm for the board, in carrying out these functions, is the Planning Committee, which will become a committee of the board.

Why go through this process? ACRL, as a national membership organization, clearly has a responsibility toward its membership to serve its members in the best possible way. It is also a professional association and needs to have a more visible presence in the library and higher education communities of this nation, and indeed of the world. ACRL is the only organization that serves all academic and research librarians and the institutions they represent; there are many issues we need to weigh in on, and we have not done so consistently in the past.

ALA's Goal 2000 and its elements are very consonant with the ideals that have been expressed over the years by ACRL's leaders. For this reason, ACRL has endorsed heartily both morally and financially the effort being put forth by ALA to enhance its representation in governmental affairs and in the rapidly changing environment of information technology policy. With this support, ACRL urges that there be specific and expert representation of libraries in higher education within the strengthened ALA Washington Office.

The reshaping of ACRL is vitally important to its continuing success, and to its future growth. The documents that describe the reshaping will be available to the membership on the ACRL listserver (acrl-frm@uicvm.uic.edu), which is intended to provide a forum for discussion of issues of common interest. I urge members of the association to subscribe to this listserver and join the conversation, helping the evolution of ACRL toward its new role in higher education in the information age.

SUSAN K. MARTIN
President of ACRL

IN FORTHCOMING ISSUES OF
COLLEGE & RESEARCH LIBRARIES

Telecommuting for Original Cataloging
Leah Black and Colleen Hyslop

Requirements for the Digital Research Library
Peter Graham

Electronic and Print Information: Active Distribution and Passive Retention in Relation to a Murder
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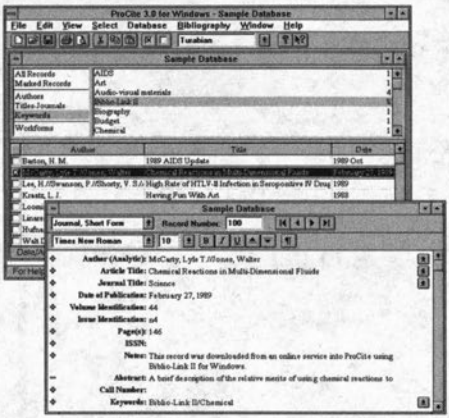

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Is Keyword Searching the Answer?

Joy Tillotson

This study looks at three aspects of keyword searching to see if defaulting to keyword searches might serve as a solution to the problems people have with subject searches in online public access catalogs (OPACs). It investigates whether keyword searching produces useful results, if people who use keyword searches to find information on a subject say they are satisfied with the results, and how keyword searching and controlled vocabulary searching are offered and explained in currently available OPAC interfaces. The conclusion is that both keyword and controlled vocabulary searching ought to be easily available in an OPAC, and that improvements need to be made in explanations and help offered to subject searchers.

Since subject searching is often unsuccessful in library catalogs (studies report success rates from 12 percent to 75 percent), it is tempting to keep looking for ways to help users get more satisfactory results.[1] Because I had observed that reference librarians use keyword searching more than library users (and this observation was confirmed in a study from Adelphi University), I decided to investigate what might happen if all searches were automatically done as keyword searches, and what effect use of keyword searches has on the level of satisfaction of library users.[2] Concluding that some changes in searching styles might be useful, I surveyed available OPAC interfaces to see whether keyword searching was easily available and whether the instructions and help offered to users of controlled vocabulary searching mentioned keyword searching.

PART 1: EVALUATION OF KEYWORD SEARCH RESULTS

Joan Cherry found that searches done as keyword rather than as exact searches (ones where the OPAC expects controlled vocabulary to be used) are more likely to produce some results.[3] She evaluated the results of the searches to the extent that she reported the searches as unsuccessful if they retrieved more than 500 citations. Jennifer Rowley reported two concerns with keyword searching. One concern is that the number of irrelevant citations in a keyword search might overwhelm the relevant ones, especially when all words in the record are searched. The other concern is that keyword searches do not retrieve all the relevant material.[4] It is possible that these concerns make interface designers reluctant to choose keyword searching as a default method. I designed the first part of this study to test these beliefs by examining the results of keyword searches for relevance.

Methodology

In this part of the study I looked at 400 subject searches in two sizes of catalog. The OPAC at Memorial University of Newfoundland has about 700,000 records and the one at the University of Toronto has about 7 million records. This

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allowed me to check whether the size of the catalog affected the number of relevant records retrieved by keyword searching. The 400 searches for the study were subject searches from transaction logs on the two catalogs—200 from each catalog. Half the searches chosen had produced no hits when originally searched; i.e., they had been entered as if they were Library of Congress Subject Headings, but they did not match correct subject headings closely enough to be found by browsing nor did they match cross-references provided by the OPACs. I did each of the 400 searches as a keyword search on the catalog it came from and recorded the following:

- the total number of items retrieved;
- the percentage of relevant items on the first two screens of short records displayed;
- the number of relevant items among the first 30 short records; and, where possible,
- the overlap between the keyword searching set and a set produced by searching using appropriate Library of Congress Subject Headings.

There is some evidence from a study by Joseph Janes that experienced librarians are able to judge reasonably well which citations a user would find relevant.[5] There is also an advantage in having a single person judge the relevance in each case, namely, that the results are more consistent than is the case when using the judgments of individual users. As a check, I randomly selected a subset of 100 searches from the 400 and had a senior library school student repeat these searches on both catalogs. I chose searches to produce a sample that consisted of equal numbers of searches from each site and equal numbers of searches that had produced some or no hits.

According to Janes, experienced library school students are not quite as good as librarians at judging relevance.[6] In this case, the student was generally more conservative in her judgments of the number of relevant citations. Because the student did the same searches in both catalogs, while I did the searches only in the catalog whose transaction logs they came from, the results cannot be compared exactly. Therefore I have used only the student's results to compare differences that may be because of the database's size.

The user whose behavior both the student and I attempted to approximate is the undergraduate looking for a couple of books on a topic. To do this, we checked the short bibliographic records displayed on the first two screens of results (7 to 12 records) for relevant items. Since not all OPACs display 7 to 12 records on the first two screens, the student and I looked also at the first 30 titles for each search. This should make it easier for people to compare our results with a similar project using their own OPAC.

I established guidelines about what would count as a relevant search and we both followed them. For example, the student and I counted a record as relevant if the search words (or synonyms or grammatical variants, e.g., sex for sexual) appeared in the title or elsewhere in the brief record. To get an idea of recall, we chose an appropriate subject heading or headings by consulting Library of Congress Subject Headings or by inspecting the subject headings in good titles retrieved by keyword searches (or a combination of the two strategies). We did a search using the controlled vocabulary term(s) and combined the resulting set of citations with the set from the keyword search using a Boolean AND to find the amount of overlap between the two sets.

Results

One argument against keyword searching is that the user will get too many useless references. The keyword searches did produce large results in some cases—an average of 1,063 citations per search at the University of Toronto (the larger database) and an average of 431 citations per search at Memorial. The results were not ten times larger in the larger database, however, nor were the resulting sets that much larger than the sets retrieved by controlled vocabulary searching (an average of 894 in the large database and 294 in the

smaller one). Despite the large sets, useful citations were often found right away. Because we were trying to model the behavior of a person who is looking for a few good books, the first thing we looked at was whether there were any good citations on the first two screens of results. The first two screens of citations (i.e., the first 7 to 12 citations) included at least one relevant item most of the time (see table 1).

In each search set, 50 percent of the searches had produced no hits at all when done as controlled vocabulary searches. Therefore, these results show a significant improvement resulting from using keyword searching. Recall that the library school student was doing the same searches on both databases and found useful results slightly more often in the smaller database, which is what might be expected.

A more standard method of measuring success in searching is to look at precision and recall. Precision is the percentage of citations that are relevant in the set of citations retrieved. I did not look at the whole set of citations because many sets were large and there is little evidence that users look at every citation in large sets. I report here only the precision of the first 30 citations. Table 2 shows that precision is somewhat better in the smaller catalog, again as might be expected. The average precision that was found in 14 studies of online bibliographic databases varied from 17 percent to 81 percent. It is hard, therefore, to draw any conclusion about how precise keyword searching is, compared to other methods, except that it is on the lower end of the range.[7]

The other argument against using keyword searching is that the searcher will not get all the relevant material. Since it is very difficult to establish the set of all relevant material in such large databases, we created sets of relevant material. The student and I achieved this by doing subject searches using the search terms if they matched LC Subject Headings or by finding the closest matches in Library of Congress Subject Headings. Sometimes no good match was found, particularly with very narrow topics. We assumed that the set of citations retrieved by the controlled vocabulary search was "all the relevant material" and checked to see how much of it was retrieved by the keyword search of the same topic. Table 3 shows what percentage of the relevant material was retrieved by the keyword searches.

The figures in table 3 look very high, given reported average recall rates of 41 to 61 percent.[8] Of course, half the searches were exact or near matches of LC subject headings; as a result, about half the time the keyword search retrieved 100 percent of the relevant material. A keyword search retrieved all of the relevant materials 33 percent of the

TABLE 1
PERCENTAGE OF SEARCHES WITH RELEVANT CITATIONS ON FIRST TWO SCREENS USING KEYWORDS

	% Larger Database	% Smaller Database
Librarian	75	71
Student	69	72

TABLE 2
PRECISION OF KEYWORD SEARCHING

	% Larger Database	% Smaller Database
As judged by librarian		
On first two screens	40	40
In first thirty titles	31	43
As judged by student		
On first two screens	27	31
On first thirty titles	20	22

TABLE 3
AVERAGE RECALL OF RELEVANT MATERIAL

	% Larger Database	% Smaller Database
Librarian	68	73
Student	65	63

time when a controlled vocabulary using the same words retrieved nothing. In 10 percent of the cases, a keyword search retrieved none of the relevant citations. In general then, it seems searchers could expect to retrieve many of the relevant citations and that the sets, although large, would not be so full of irrelevant citations as to be useless. Also, as previously discovered, keyword searches were often successful when an exact search on the same terms produced no results.

From these results it seemed likely that people who used keyword searching were more likely to be satisfied with the results. The next step was to try to verify this by asking users.

PART 2: ONLINE SURVEY AND TRANSACTION LOGS

Since it seemed likely from part 1 of the study that people who used keyword searching would be more satisfied with the results, part 2 looked at the satisfaction reported by users who used keyword searching compared to that of searchers who used controlled vocabulary searching. An online survey of user satisfaction with the OPAC was conducted at the University of Toronto.[9] The OPAC uses Data Research Associate's Information Gateway interface that offers users a choice of exact and keyword searching methods on a high level menu (see figure 1).

One survey question was "What did you find in your search session today?" The possible responses were: nothing you were looking for, some of what you were looking for, enough of what you were looking for, exactly what you were looking for, and more than you were looking for. For 189 of the survey respondents, transaction logs were available so that I could check whether they had used exact or keyword searches and relate the search technique to the response to the survey question. Of these 189 respondents, 29 people said in the survey that they were planning to search by subject only. Others were doing more than one type of search, e.g., searching by subject and looking for a specific item. Eleven of those searching by subject used controlled vocabulary searches only, and 18 used keyword searching of some kind. Figure 2 shows that people using keyword searches were less satisfied with their results.

I do not like to draw major conclusions from so few searches, but the results do

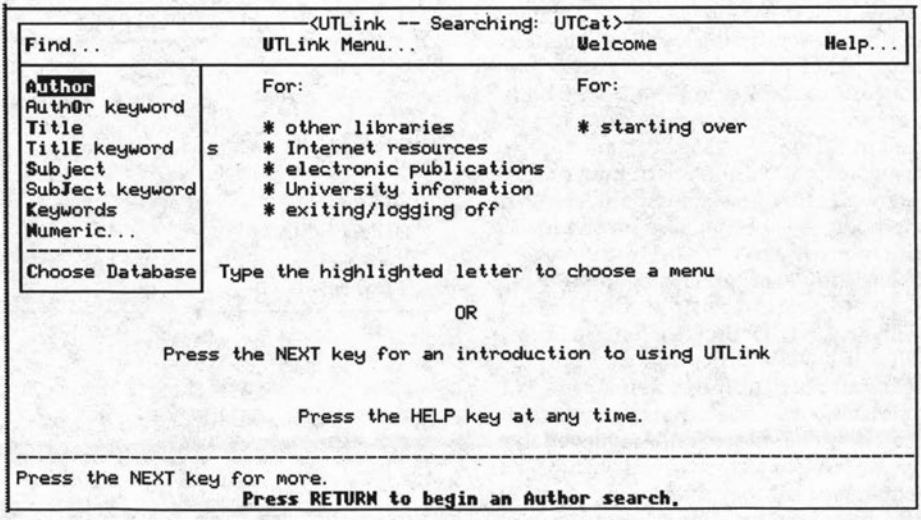

FIGURE 1
Choices Offered to the Searcher on the University of Toronto OPAC

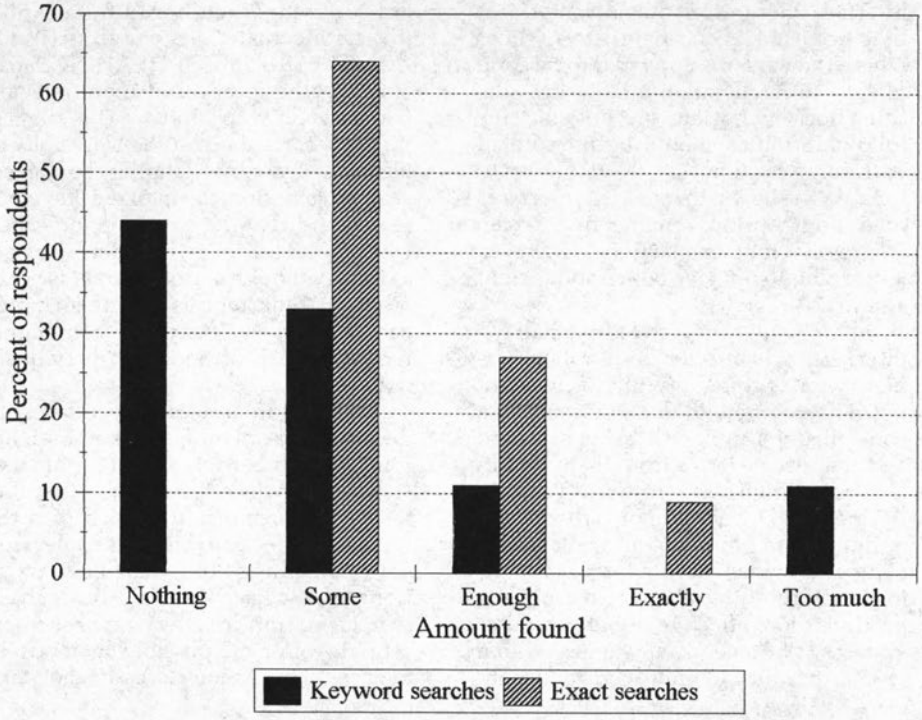

FIGURE 2
What Twenty-nine Subject Searchers Said They Found:
Comparison of Keyword and Controlled Vocabulary (Exact) Searches

not point to keyword searching as a panacea for the problems of subject searching. Part of what happened is that people resorted to keyword searches when an exact search failed and then found nothing they liked with the keyword search either. Some keyword searches produced citations that appeared to be about the topic, but were still declared unsuccessful by the searcher.

PART 3: SURVEY OF OPAC INTERFACES

I concluded from parts 1 and 2 that both keyword and controlled vocabulary searching ought to be available. Since other writers have come to the same conclusion, I decided to complete the study by seeing how well this idea was implemented in OPAC interfaces currently in use.[10] I decided to look at whether keyword searching was an obvious option in most OPAC interfaces and how well the differences between keyword and controlled vocabulary searching were explained. My curiosity on these points was fueled by two recent research results. One was Terry Ballard's finding that a change in the amount of keyword searching followed a change in the position of the keyword search option on the menu.[11] The other was the fact that about half (48.3 percent) of the respondents in the survey discussed above were not aware that they should be using Library of Congress Subject Headings when they chose to search by subject.

I looked at 17 OPAC interfaces available on the Internet, using the list provided by Hytelnet (version 6.3). I chose the first North American (or first English-language) site listed for each

interface type and left out only interfaces that occurred at a single site or ones where the versions appeared to be completely different at different sites. Because local variations are possible, the following tables should be interpreted with some caution.

Table 4 shows that many interfaces offer both options on the first screen where searching can be done. However, 35 percent do not give both options right away.

Table 5 shows that fewer than half the interfaces which offer both options explain what is going on with exact searching. That is, they do not mention that a controlled vocabulary is being searched and that use of terms from that vocabulary might give better results.

This lack of explanation is disturbing in light of literature about mental modeling and evidence from technical writing literature that better instructions produce more effective use of computer systems.[12-15] Steven Zink suggested in a 1991 article that an improvement in subject searching might result from explicitly stating that "Use of LIBRARY OF CONGRESS SUBJECT HEADINGS may result in the location of more relevant materials on your topic."[16] This suggestion was carried out at the University of Nevada, Reno, by changing the Subject searching option to invoke a keyword search and creating a new option called LC Subject Heading which does an exact search. Although a formal study is yet to be done, Zink reports that this change has resulted in "far fewer complaints regarding lack of books on previously noted subjects."[17]

Although interfaces may offer both methods of searching and explain what is meant by them, it is almost certain that some users will not pay close attention to the instructions. Table 6 shows the type of help available to people who enter something other than a Library of Congress Subject Heading at a subject search prompt. It is very rare for interfaces to offer all possible methods of help, and many interfaces do not take

TABLE 4
SEARCH OPTIONS BY INTERFACE TYPE

Interface and Location	Both Search Methods on First Screen	Keyword Search Only on First Screen	Exact Search Only on First Screen
BLCMP (Birmingham)		X	
BuCAT (Athabasca)		X	
CATS (Cambridge)	X		
DOBIS (Emory)			X
DRA Atlas (Abilene)	X		
Dynix (Alma)	X		
GEAC (Atlantic School of Theology)	X		
INNOPAC (Ada)	X		
Libertas (Bristol)		X	
LS/2000 (Appalachian)	X		
Mutilis (Baylor)			X
NOTIS (Auburn)	X		
PALS (Creighton)	X		
UNICORN (Kennesaw)	X		
URICA (Australian National University)	X		
VTLS (William and Mary)	X		
Z39.58 (Dartmouth)		X	

TABLE 5
EXPLANATIONS OF CONTROLLED VOCABULARY SEARCHING

Interface and Location	Explains Exact Searching	Does Not Explain	Does Not Have Exact Searching
BLCMP (Birmingham)			X
BuCAT (Athabasca)			X
CATS (Cambridge)	X		
DOBIS (Emory)		X	
DRA Atlas (Abilene)		X	
Dynix (Alma)		X	
GEAC (Atlantic School of Theology)	X		
INNOPAC (Ada)	X		
Libertas (Bristol)			X
LS/2000 (Appalachian)		X	
Mutilis (Baylor)		X	
NOTIS (Auburn)		X	
PALS (Creighton)	X		
UNICORN (Kennesaw)		X	
URICA (Australian National University)	X		
VTLS (William and Mary)	X		
Z39.58 (Dartmouth)		X	

TABLE 6
HELP OFFERED TO SEARCHERS WHO GET NO HITS WITH A SUBJECT SEARCH

Interface and Location	Uses LC Cross-references	Displays Alphabetical Near Matches	Uses or Suggests Keyword Searching
BLCMP (Birmingham)			X
BuCAT (Athabasca)			X
CATS (Cambridge)	X	X	
DOBIS (Emory)		X	
DRA Atlas (Abilene)	X		
Dynix (Alma)	X	X	
GEAC (Atlantic School of Theology)		X	
GEAC Advance (Boise State)	X		
INNOPAC (Ada)	X	X	X
Libertas (Bristol)			X
LS/2000 (Appalachian)		X	
Mutilis (Baylor)			X
NOTIS (Auburn)	X		X
PALS (Creighton)			X
UNICORN (Kennesaw)		X	X
URICA (Australian National University)			X
VTLS (William and Mary)	X	X	
Z39.58 (Dartmouth)			X

advantage of the possibility of keyword searching.

CONCLUSIONS

From part 1 of this study, I concluded that if users had entered the same terms as keywords instead of subjects, they would have had more satisfactory results. However, part 2 did not confirm that users were happier with the results when they used keyword searching. It did indicate that, given an easy choice, people will choose to use both keyword and controlled vocabulary searching; as a result, I concluded that both should be available. From part 3, it was clear that OPAC interfaces are doing reasonably well at offering both options but less well at explaining the use of controlled vocabulary and offering help with unsuccessful searches. In light of the fact that increasing numbers of users are using our catalogs from remote locations with no access to lists of acceptable subject headings, it would seem that improvements in these last two areas should be a priority for improvements to OPAC interfaces.

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Cyrillic Transliteration and Its Users

Alena L. Aissing

A wide diversity exists in the current practice of transliterating Cyrillic scripts for use in bibliographic records in online catalogs. Without knowing which transliteration table was used, it is difficult to retrieve the desired record successfully or efficiently. Retrieving an item (e.g., titles or an author's name) from a library's online catalog (OPAC) where it is given only in transliterated form can be a confusing task, even for users who know the Russian language or at least the Cyrillic alphabet. This study explores the problems besetting three groups of Russian-language students faced with romanized Cyrillic bibliographic records. It also tries to investigate students' ability in searching the Russian records romanized according to the Library of Congress (LC) transliteration table. Analysis of the test results show the students' success-and-error rate before and after instruction. The findings of this study establish that transliteration is one of the factors limiting access by Russian language students to the Slavic collections.

Students in foreign language classes usually experience various difficulties in finding library materials in the languages they study.[1] One of the most intractable problems confronts readers of Russian, since records they want to access have been modified (i.e, romanized) by transliteration or transcription into the Roman (English) alphabet. Transliteration is a process in which each character of the source language is converted into a character of the target language; for example, Russian спутник (companion, satellite) becomes *sputnik*. Transliteration needs to be distinguished from transcription, in which the sounds of the source words are conveyed by letters in the target language. For example, an English transcription of former President Mikhail Gorbachev's name would have to be Gorbachoff, to reflect the way it is pronounced in Russian.[2]

There are several different transliteration systems for Cyrillic script used throughout the world. Most of the currently used systems are based on graphical and/or phonologic similarities between Cyrillic and the target language. However, not all transliteration

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or transcription is systematic. Both transliteration and transcription depend on the source and target language, and differ from case to case (see table 1). A searcher has to be aware of the array of variations in transliteration schemes, particularly if the search is being done in more than one database.[3] A transliteration scheme that is systematic does not necessarily have a broad application. For example, the transliteration scheme used by *Physical Review* is intended for scholarly application. The Library of Congress transliteration is intended for the general user and is standard for most academic libraries in the United States. Recently, the LC transliteration system in its simplified form (without the diacritics) has been appropriated by various scholarly publishing organizations.[4]

Since these problem areas could affect the student's academic performance, it is important to question the effectiveness of transliteration as a method for bibliographic control and its usefulness for the user. This phenomenon has been analyzed during the past years by several authors, although no research has been done involving actual users.[5–9] This study tries to fill this gap by investigating whether bibliographic searches for transliterated Russian titles or names are difficult for someone who knows the Russian language or at least the Cyrillic alphabet. The data for this research were gathered using three-part tests. These tests were distributed among Russian-language students at the University of Florida, Florida State University, and the University of Illinois at Urbana-Champaign during the period 1990–1993.

BACKGROUND AND LITERATURE REVIEW

Several Cyrillic transliteration schemes have been proposed on the local, national, and international levels at various times. Some were attempts at correcting and improving existing schemes. Others came up with new proposals, such as Dekleva's Uniform Slavic Transliteration Alphabet (USTA) that consisted of ninety-seven graphemes combining Roman letters and diacritical marks.[10,11] It was never adopted, however, probably because its features were unfamiliar to both English- and Slavic-speaking readers.

Because the number of Roman letters in the English alphabet is less than the number of Cyrillic letters in the Russian alphabet, most of the transliteration systems have to resort to the use of diacritics or letter combinations to achieve a com-

TABLE 1

EXAMPLE OF TRANSLITERATION OF THE WORDS *ЧИТАЛЬНЯ* AND *ХЛЕБНИЦА* AND *ЮШКЕВИЧ* IN VARIOUS TRANSLITERATION SYSTEMS

System	читальня	System	хлебница	System	Юшкевич
LC	chital'n͡ia	LC	khlebnitsa	BM	Yushkevich
ISO	čital'nja	ISO	hlebnica	NUC (LC)	I͡Ushkevich
BSI	chital'nya	NYPL	khlebnitza	GNC	Juškevič
MR	čital'nya	SR	khlebnica	OFC	Iouskevich

Abbreviations used in this table

LC	Library of Congress	SR	Slavic Review
ISO	International Organization for Standardization	BM	British Museum
BSI	British Standards Institution	NUC	National Union Catalog
NYPL	New York Public Library	GNC	German National Catalog
MR	Mathematical Review	OFC	Old French Catalog

plete transliteration.[12] This can present several problems for the users of the catalog who have to deduce how these diacritics or letter combinations translate back to the original Cyrillic characters.[13] The differences among the various schemes are considerable, especially for those Cyrillic letters for which no Roman equivalent exists: ё, ж, х, ц, ч, ш, щ, ю, and я.[14] In addition, Russian has no *h* and represents this sound mostly as г, therefore, transliterating *Hamlet* from Cyrillic back to Roman script results in *Gamlet*.[15] A Russian name beginning with я might be transliterated into *ia, ja,* or *ya* with major retrieval problems unless the conversion system is known. A further problem is that certain phonemes characteristic of Slavic languages cannot be written unambiguously as a single Roman letter (assuming English pronunciation).[16]

The Library of Congress offers a separate transliteration table for every Slavic language written in Cyrillic scripts.[17] This can lead to more inconsistencies. For example, ie is used when transcribing Ukrainian є and old Russian ѣ. That is, the same combination of Roman letters is used for two completely different Cyrillic letters! The user has to know or recognize the original language in order to find the corresponding transliteration when searching the library's online catalog.

Readers of non-Roman documents usually want to see the original script, because it is more familiar to them than the romanized version.[18] Cyrillic script has been implemented on a number of systems. The first American library to automate Cyrillic script was the New York Public Library, where Cyrillic script records were included in its book-form "Dictionary Catalog," phototypeset from machine-readable copy.[19] Cyrillic script capability was added to the Research Libraries Information Network (RLIN) in 1986.[20] Cyrillic is one of the scripts implemented on ALEPH, the Israeli library system.[21,22] The British Library's online catalog includes not only the characters of modern Cyrillic script but also Old Church Slavonic.[23] VTLS, Geac, and IME[24] have contracts to develop systems for Russian libraries; Cyrillic script capability is a fundamental requirement.

Few American libraries have taken advantage of these developments because of the pervasive belief that romanization is adequate for those languages written in Cyrillic script. (The results of this study undermine this belief.) Because of this conviction, most libraries do not own systems that can utilize other scripts, nor do they have enough funding and concern for the multilingual needs of their community.[25] Users cannot search and display a bibliographic record in the script of the original document.[26] Most local OPACs are limited to Roman character sets and do not provide the proper typographical facilities necessary for the display of non-Roman languages. Therefore, romanization of non-Roman scripts is necessary if the automated catalog is to be a comprehensive representation of the library's holdings.[27]

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Yet there are some hopeful signs that this situation is changing. Several authors have discussed the problems for users caused by romanization, and the attitude of librarians toward minority users is changing.[28] Allen and Plumer cite many examples of practices and methods that tend to alienate a library's international clientele: awareness is the first step toward correction.[29,30]

Recent developments in computer software and standards will eventually do away with this limitation.[31–34] In the past, research and formulation of standards for the automation of non-Roman scripts was slow and fragmentary. In addition, the library community developed its own standards in isolation from the standards-making of the computer industry.[35] These standards were incorporated into USMARC and UNIMARC.[36,37]

Today, there is a new universal multiscript character set, International Standard ISO/IEC 10646.[38] The Unicode™ character set, which is code-for-code identical with ISO/IEC 10646, is being implemented in products from leading computer companies.[39] The advent of this new standard facilitates the development of global software capable of processing any script. No longer will libraries have to develop systems on their own; many of the features needed for multiscript processing will be included in the standard package or can be added easily. This will be a boom to the users of various non-Roman scripts. Service to the user and provision for the most direct access to dissimilar documents (i.e., documents not in the predominant script used by the library) need to be seen as the prime responsibilities of libraries.

RESEARCH DESIGN AND METHODOLOGY

Pretest

A sample of 50 Russian language students was randomly chosen from the Department of Germanic and Slavic Languages and Literatures at the University of Florida during the spring semester of 1991. None of the students was familiar with the LC transliteration table. The data were collected using three tests consisting of a list of titles and proper names in Russian. The students were then asked to transliterate the Russian items on the list. The objective of these tests was to determine: Test A—How correct are the students' searches without the knowledge of the transliteration table and what are the problems involved? Test B—How correct are the students' searches after receiving instruction and practicing the transliteration in the library? Another test (C) consisted of retrieving and locating at least three items—one title search, one author search, and one journal search. Most of the students visited the library, located the items, and brought back the call numbers and the location codes of the materials requested. Test B was then given to the students after they practiced what they learned from my instruction. I tried to ascertain whether they still had problems and how much they had improved. After the data were statistically analyzed, the findings showed that without the knowledge of the LC transliteration practice of Russian letter я by ĵa, for example, 80 percent of the students chose ya, whereas only 7 percent were correct. When students had to deal with Russian ш (phonetically very similar to English sh), 91 percent were successful even without knowing how to transliterate. It is likely that any grapheme transliterated by a letter combination for which the English pronunciation does not resemble the Russian sound becomes a barrier to access. This pretest concentrated on transliteration of only 7 letters—those for which transliteration could be problematic: я,ю, ц, щ, й, х, and ж. None of the students was able to transliterate all 7 tested letters correctly (the average correct score of the tested individuals was only 1.1 correct out of 7). The instruction and approximately one week practice resulted in an overall improvement in the scores for the individual letters (the average score increased to 4.3 out of 7). Results of a paired *t*-test indicated that the improvement of the test scores is highly significant ($t = 0.001$). Finally, only 14.6 percent of the students were able to transliterate all 7 letters.[40]

Actual Research

Because the sample size was rather small and the Department of Germanic and Slavic Languages and Literatures at the University of Florida offers only undergraduate classes in Russian, inferences from the data analyses were limited and showed a high degree of uncertainty. To get a more reliable picture of the problem, the study was extended to include more students from Florida State University and the University of Illinois, including graduate students. One hundred forty-five undergraduate and graduate Russian language students from these three universities were the sample size for the actual research. The randomly selected students were tested by the use of three

specifically designed tests and a questionnaire. Tests A and B were similar to those used in the pretest, consisting of a list of Russian proper names and titles in an (ideally) isomorphic representation of the title pages of several actual documents in the Cyrillic alphabet.[41] In both tests, special attention was given to those graphemes that cannot be rebuilt reversibly and to those that are difficult to transliterate: я,ю, ц, щ, й, х, and ж. Test A was intended to investigate how successful the students would be in searching and retrieving transliterated records without any instruction. This also showed how well the library had been preparing students in the past. Test B was given to the students after they were instructed in the use of a transliteration table. This transliteration table was a simplified form of the LC transliteration table for the Russian language without the diacritical marks. (Diacritical marks are generally ignored in OPAC indexing.) The results would indicate whether there was significant improvement or whether there were still residual problems. Test C included both transliterated titles and proper names where no part of the original data remains unchanged, and the matching process can become cumbersome. This is exactly how the student would find the bibliographic data on an OPAC display screen in the library. The students had to show how they were able to decode, reverse, match, and identify the names of authors or titles of works back into the Cyrillic script. In other words, the users had to match each letter of the romanized script with the original alphabet equivalent. For a reader familiar with the language and the original script of the work, the transliteration could be a serious obstacle resulting in partial or even total loss of information. This test, therefore, tended to indicate the obstacles in the matching process.

At the end of the testing, each student was asked to fill out a questionnaire. This questionnaire was developed to assess not only transliteration use but also primary library use patterns and utilization of collections, services, and facilities by Russian-language students. Basic demographic data such as number of years in school were collected as well. Additional information about the users (education, library use, problems with online searching, their personal opinions, etc.) was used in interpreting the tests. For example, if the student did not use the library often, the probability in making errors in online searching might be relatively higher. The Russian-language students were asked:

- whether they use library services;
- whether they were familiar with the library's online catalog/OPAC;
- whether they had problems with retrieving English bibliographic records;
- whether they had problems with retrieving Russian bibliographic records;
- whether they were familiar with the LC transliteration table; and
- whether they would prefer using and displaying the Cyrillic alphabet, etc.

The data were compiled, tabulated, and analyzed using the statistical software JMP, version 2.0 for the Macintosh.[42]

FINDINGS

Success-Failure Report

Test A. Students transliterated a list of selected titles and names in the Russian language with no prior instruction and no transliteration table provided. Students had to create their own search structures depending on whatever knowledge of Russian phonology and orthography they had, making use of their own concept of transliteration. In some cases, the result was a combination of translation, transliteration, and transcription. Out of 145 students who took test A, 14 partially translated the Russian words into English instead of transliterating them. Table 2 shows the frequency distribution of number of mistakes by the number of students who made them. There were 93 letters (19 words) in test A. Commonly encountered titles, such as Александр Сергеевич Пушкин or России первая любовь, were used. The largest possible number of mistakes was 93, since there were 93 letters. Test results showed that in any situation of not knowing the

TABLE 2
NUMBERS OF ERRORS MADE IN TESTS A AND B

	Test A		Test B	
Interval	Count*	%	Count*	%
0	0	0	20	15
1–5	4	3	59	43
6–10	19	13	20	15
11–15	28	19	13	9
16–20	25	17	7	5
21–25	26	18	6	4
26–30	12	8	5	4
31–35	15	10	2	1
36–40	6	4	2	1
>40	10	7	3	2
Total	145		137	

*The difference in total counts was due to the fact that some students did not participate in the second test.

transliteration table, none of the students would be able to conduct a 100 percent successful search. The lowest number of mistakes made was one, and only one person achieved this rate. The average number of mistakes made was 21.6. The largest group of students, 28, made between 11 and 15 mistakes.

For a reader familiar with the language and the original script of the work, the transliteration could be a serious obstacle resulting in partial or even total loss of information.

Test B. Test B consisted of 82 letters (in 16 words) which included words similar to the ones used in the first test (for example, in examining the soft vowel я, test A included the word первая and test B had the word современная). Table 2 showed the frequency distribution of mistakes by the number of students who made them. The table shows that the library instruction and practice resulted in a clear overall improvement. Twenty students transliterated all 82 characters without any mistakes, followed by 59 students who made fewer than 6 mistakes in their search structure. This constituted the largest student unit, forming 43 percent of the total sample. Only one person had all 82 letters wrong. The average number of mistakes made was 8.9.

Special attention was given to the letters that either cannot be rebuilt reversibly and to those that must be transliterated by letter combinations. These letters were я,ю, й, ц, ш, х, ж, ч, and щ. The results for these letters are compiled in figure 1. In the comparison of the two tests significant improvement is seen. It also becomes clear that the students are dealing with two groups of letters: those that represent sounds similar to the ones encountered in the English language and those that represent sounds that are alien to English speakers. The improvement in the second group is more impressive than that experienced in the first group. The first group consists of the letters ц, ч, and ш, whereas the second group is formed by ю, я, й, х, ж, and щ. In the first group the average improvement after instruction is almost negligible; in the second group it is always more than 27 percent. It also seems that the vowels are more difficult to transliterate than the consonants. A good example of the problems in transliterating Cyrillic letters is given by the

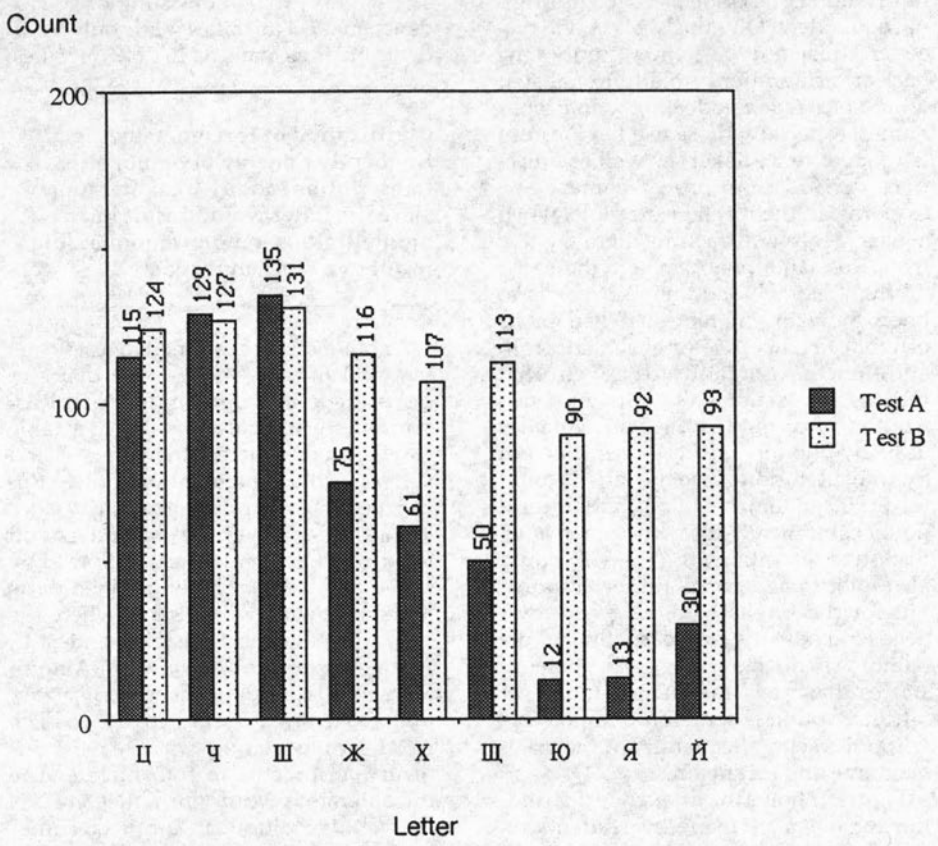

FIGURE 1
Comparison of Test A and Test B for the Letters Я, Ю, Ц, Ш, Х, Ж, Ч, Щ, and Й

letter ю. In modern American English there are several ways one could write this sound, including ewe, yu, you, or even u. In fact, the version used by LC "fu" is counterintuitive, because there seems no relation between the transliteration and the everyday "sound" of the Cyrillic letter.

Test C. After instruction, test C was given to the students as well. This test included a list of transliterated Russian titles and authors' names. If a student were to search a book written in a Cyrillic script in the online catalog, this would be the way in which it would display. The user then would have to match the transliterated information with its Cyrillic version and reestablish the text in its original characters to determine if a given record matches the one sought for.

The reconstruction or back-transliteration can be performed only between two alphabetic scripts and depends on the rules governing the relationships between the letters of these two scripts.[43] Applying the rules of transliteration in reverse can cause some difficulties since this process involves at least three different stages: (1) the user must know how the word appears in the original (i.e., Cyrillic) alphabet; (2) the user needs to know how to use the transliteration rules; (3) the user should be skilled in recognizing that this transliterated

information does indeed match its original equivalent. Obviously, users will discover this only if they apply the back-transliteration. An additional step would be needed in dealing with proper names, especially those used in Western languages (e.g., Baker) as well as adjectives derived from proper names (e.g., Copernican theory). For example, when a user deals with a transliterated text from Russian alphabet where the name "Brown" is included, the user needs to know how this name is spelled in its original (in this case English script). In addition, the user needs to be aware that the Russian version will be Браун. Cyrillization of foreign names is frequently done by phonological transcription, not by transliteration since the latter would result in an unintelligible and unpronounceable result to a Russian reader. Back-transliteration of "Браун" could also refer to a German author "Braun," but for the English language, the user needs to know the correct spelling of the name. This example clearly demonstrates that back-transliteration and/or retranscription is sometimes impossible without tracing the identity of the original name and its spelling.

Figure 2 shows the frequency distribution of mistakes made by students on test C. The data were collapsed into 16 groups showing that after instruction, 3 students did not make any mistake in reversing the transliteration process. The largest group, consisting of 20 students, made 3 mistakes while only 5 students made as many as 16 to 17 mistakes.

Cyrillization of foreign names is frequently done by phonological transcription, not by transliteration since the latter would result in an unintelligible and unpronounceable result to a Russian reader.

Another factor examined in test C was the total number of mistakes that students made individually for each Russian letter. This analysis is shown in table 3, where as predicted, the letters ю and я, (represented combinations of two Roman letters when romanized) caused a lot of trouble. The most misunderstood letter was и (140 mistakes), followed by ы (94) and й (80). The underlined parts of the following words show where the students made most mistakes on test C: Андрей Яхонтов, София, ларец Марии Медичи; сборник фантастических приключений, закон пруподы. The word "прилючений" was the most difficult for students to transliterate. The transliterated word "prikliuchenii" is the genitive plural of "приключение" (in English *adventure*). Since the Russian language changes its noun endings in particular cases, the user needs to take this into consideration when transliter-

TABLE 3
ERROR COUNT FROM TEST C BY LETTER

Letter	Count	Letter	Count	Letter	Count
а	5	б	0	в	2
г	1	д	3	е	15
э	1	ж	4	з	10
и	140	й	80	к	2
л	3	м	1	н	5
о	2	п	3	р	5
с	1	т	10	у	25
ф	5	х	35	ц	31
ч	11	ш	11	щ	22
ы	94	ю	90	я	96

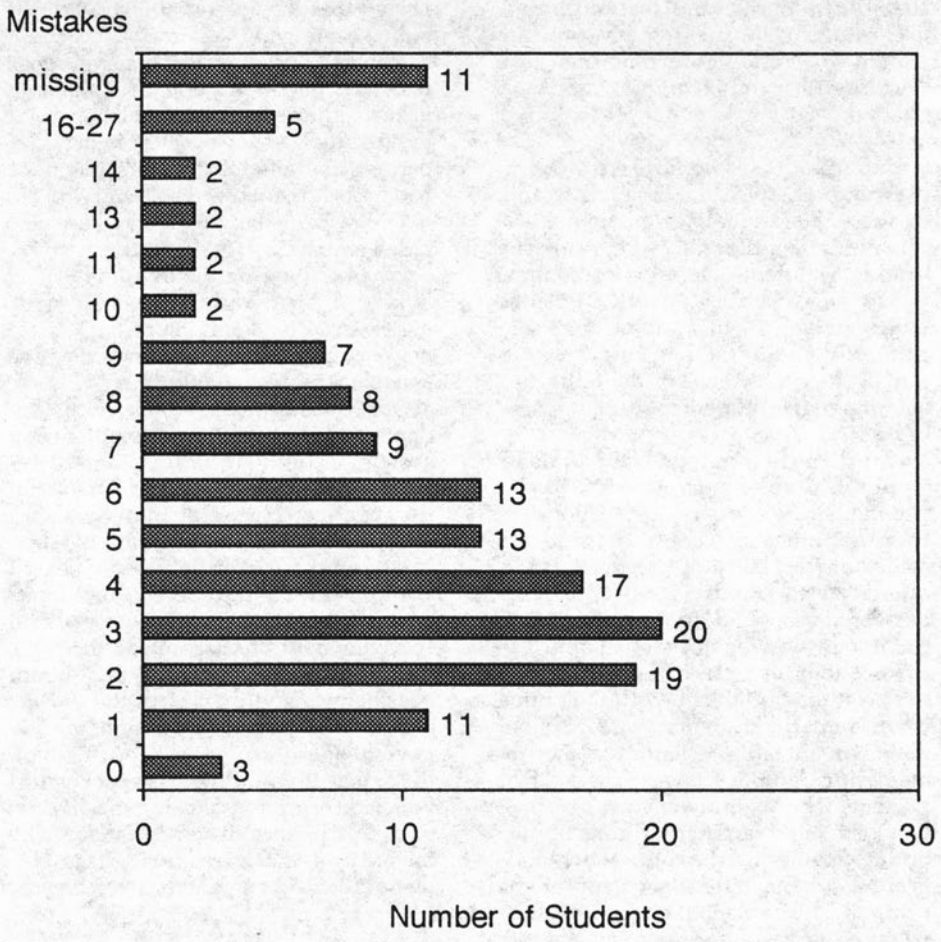

FIGURE 2
Frequency Distribution of Mistakes Made by Students on Test C

ating from Russian and/or back-transliterating into Russian. When students dealt with transliteration of the word "приключений," in most cases, they omitted one of the last letters or substituted the English letter y for them. (Phonetically Russian й is considered identical with the English y as in yes.) Even though transliteration assumes following the rule of "write what you see" (i.e., performing exclusively orthographic transliteration where the user should concentrate only on the letters not on their sounds), the example above demonstrates that the users attempted to base their transliteration on both orthographic and phonetic rules at the same time. In practice, it could mean that all bibliographical transliteration systems contain some elements of phonological transcription that are based on the historical habit of pronouncing certain letters in a certain way. These habits are probably acquired in childhood, and it is just as difficult to change them as any other phonetic attributes of articulation such as stress, pitch, and intonation. The study shows

that the students tend to transliterate according to the spelling and pronunciation convention governing their own (i.e., English) language.

Questionnaire

Undergraduates comprised the largest group of students (79 percent), and, of these, 40 percent were seniors. The remaining 21 percent were primarily graduate students. Only 1 percent of the group were Ph.D. students. Thus the data gathered in this survey represent primarily undergraduate students' patterns rather that those of the total Russian-language student population (see table 4).

One of the first questions the students were asked in the survey was "Do you use the library services?" In response to this question, 9 percent of the students said that they did not use the services offered by the library while 85 percent answered yes. Nine students (6 percent) did not answer the question at all.

Additional analysis of the relationship between the familiarity with the online catalog and the students' years in school is shown in table 4. Based on the frequency distributions, it was expected that students who spent more years at school would be more familiar with the library online catalog and the concept of bibliographic access. Table 4 shows this to be primarily the case. Of those students who were freshmen, only 35 percent said that they were familiar with the online catalog, while 65 percent of graduate students and 100 percent of doctoral students reported that they were familiar with the online catalog in the library.

Another question of the survey dealt with the students' experience of problems in the retrieval of Russian bibliographic records. Table 5 shows that 37 students (26 percent) answered that they "sometimes" had problems, followed by those who did not know (28 = 19 percent) and those who answered no (27 = 19 percent).

When answering the question "What kind of problems did you have in retrieving a Russian bibliographic record?" 48 (33 percent) students indicated transliteration as a major problem (table 6).

One question also dealt with students' familiarity of the transliteration system. Table 7 indicates that 73 respondents (50 percent) indicated that they can search Russian materials with the help of the transliteration table. Those who felt that they could search without a table numbered 40 (28 percent) and 2 students (1 percent) said that they could not search at all.

To find out students' opinion about possible use and display of the Cyrillic alphabet in their online search, the following question was asked: "Do you think that it would be easier for you if you had the option of using the original Cyrillic alphabet in your search?" The majority of the Russian-language students (105 = 72 percent) answered yes.

IMPLICATIONS

The intent of this study is to examine the public reaction to online retrieval of material involving Cyrillic script trans-

TABLE 4
FAMILIARITY WITH ONLINE CATALOG, BY YEARS IN SCHOOL

	Years in School											
	Freshman		Sophomore		Junior		Senior		Graduate		Doctoral	
Familiarity with online catalog	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	7	35	7	47	24	73	25	54	13	65	2	100
No	5	25	3	20	4	12	9	19	3	15	0	0
Little	8	40	5	33	5	15	12	26	4	20	0	0
Number of students	20	14	15	10	33	23	46	32	20	14	2	1

$X^2 = 11.12$; $df = 8$; Cramer's $V = 0.194$

TABLE 5
FREQUENCY DISTRIBUTION FOR PROBLEMS WITH ONLINE CATALOG IN GENERAL AND WITH RETRIEVAL OF RUSSIAN TITLES

	Online Catalog		Retrieval of Russian Titles	
Response	Frequency	%	Frequency	%
Unknown	28	19	14	10
Always	12	8	2	1
Sometimes	37	26	41	28
Seldom	10	7	28	19
No	27	19	41	28
Never tried	31	21	19	13

TABLE 6
FREQUENCY DISTRIBUTION FOR KIND OF PROBLEMS WITH RETRIEVAL OF RUSSIAN TITLES

Kind of Problems with Retrieval	Frequency	%
Unknown	76	52
Transliteration	48	33
Diacritical marks	3	2
Not familiar with online catalog	7	5
Other	11	8

TABLE 7
FREQUENCY DISTRIBUTION FOR FAMILIARITY WITH TRANSLITERATION

Familiarity with Transliteration	Frequency	%
Unknown	26	18
Can search with transliteration table	73	50
Can search without transliteration table	40	28
Cannot search at all	2	1
Needs help	4	3

literated into Roman letters in a primarily English-language environment. The difficulty of searching for transliterated Russian records for someone who is familiar with the Russian alphabet was tested, involving students at three universities. The analysis of the findings provides insight into the problems of Russian-language students when they try to access transliterated Cyrillic bibliographic records. These data enable the author to determine any statistical significance of particular variables on students' success-failure rate. As expected, the measurements strongly suggest that the use of transliteration in bibliographic records forms a barrier to access even for those skilled in the original script. A number of other factors, such as unfamiliarity with online searching and with library resources, exacerbates this problem, but such factors are, of course, not peculiar to language students. The important point is that, even after hours of instruction in the LC tables, most students still felt that searching in the original alphabet would be more efficient and easier. It seems likely that such feelings are not limited to the Cyrillic alphabet, but would apply to records in other non-Roman scripts as well.

Any academic library needs to examine its user population in order to develop and implement appropriate services. Assessing the needs of foreign-language students in American colleges or universities ought to be an integral part of library instruction programs. Because of the scale of the problem, library instruction for Russian-language students should not only be the responsibility of reference librarians but also of the Slavic studies faculty, too. Both groups must, on the strength of this study's findings, include a session on transliteration that will help students acquaint

themselves with the system and teach them how to interpret particular characters in the Cyrillic script that could be troublesome.

Transitions in computer standards that support multiple-character sets in the libraries are predictably slow. Nevertheless, multiscript-character set, the Unicode standard/ISO 10646, that supersedes the traditional ASCII (American Standard Code Information Interchange) character set has been developed. Perhaps academic libraries will eventually acquire systems based on this new standard. Implementation of this sixteen-bit character encoding that can represent the principal written languages collected by American academic libraries, would mean a revolutionary change in serving foreign language students. It is up to the librarians, developers, and programmers to make the change.

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Students' Perceived Effectiveness Using the University Library

Cheryl Ann McCarthy

Many academic libraries are wondering whether they are providing adequate physical and intellectual access to library resources for their students. Before planning new services, academic librarians must first evaluate students' current information needs, skills, and satisfaction in using library resources. By using a survey in this investigation, students were asked to rate their effectiveness, their satisfaction, and their needs and expectations in the use of library resources at the University of Rhode Island. After collecting 608 surveys, the data were coded, tabulated, and analyzed, using both quantitative statistical analysis and qualitative content analysis. While the majority of students believe that they are effective seekers and users of library resources, 40 percent were not satisfied with their search for information and materials found. When students were asked what they needed to become more effective users, students recommended better organization and availability of materials, more books and journals, more training and classes, more staff and staff assistance, and enhanced computer facilities.

While demands and costs for library resources and services increase and budgets decrease, how can university libraries ensure that students have physical and intellectual access to resources needed? How can university libraries ensure that students know how to use library resources effectively, especially online catalogs and CD-ROM databases? How do students' expectations change with the advent of these new technologies? Furthermore, do students know how to formulate research questions and how to identify, locate, select, and use resources relevant for their research questions? While planning library instruction and services, librarians should first ask students about their information needs, skills, and satisfaction in using library resources. Therefore, this study assesses the students' perceived effectiveness, their satisfaction, their needs and expectations in the use of library resources at one university library.

THE UNIVERSITY OF RHODE ISLAND LIBRARY: EXPANSION AND EXPECTATION

At the time of this study, spring 1993, the University of Rhode Island Library reached a milestone with near completion of an expansion and renovation project, adding 89,000 square feet and acquiring its one-millionth volume. Simultaneously with the rebuilding project, the new integrated online public access catalog (OPAC) arrived. The new library, aesthetically pleasing with enhanced computer access, faces a new dilemma: how to meet the increasing expectations of its users in this state-of-

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the-art-facility. Diminishing budgets from the state of Rhode Island continue to affect both materials collection and staffing. Expensive serials have been eliminated and staff positions have remained unfilled. During the two-year construction project, the library staff endured five moves of the entire collection while they continued to provide uninterrupted library service. Everything seemed topsy-turvy, even when it was not. Stress on both library staff and users was great. No longer could users determine location of materials from past experience. Each visit to the library required a mental shift. At the time of this study, most of the materials and the OPAC terminals were in their permanent home, but some confusion lingered.

With the introduction of new CD-ROM databases and new OPAC terminals, it became apparent that students expected better and faster access to materials both inside and outside the University Library. The University Library's OPAC is part of a consortium of academic libraries in Rhode Island called the Higher Education Library Information Network (HELIN). HELIN consists of the libraries of the University of Rhode Island, Rhode Island College, the Community College of Rhode Island, Providence College, and Roger Williams University.

In addition to the refurbished library, University President Robert Carothers proposed a new vision for the University of Rhode Island, redefining the role of student from a passive learner to an active learner and a collaborator in research. Also under consideration is a proposal for a revised undergraduate interdisciplinary program using smaller seminar classes. Common sense suggests that demands for library materials and services will increase with a new curriculum emphasizing research. Whether present and future students have the necessary research skills to develop search strategies and to use appropriate library resources remains the question.

This study attempts to identify students' perceived research abilities and their satisfaction in the use of university library resources. Though narrow in scope and focus, this study identifies strengths and weaknesses in students' research skills. In addition, it may influence planning and future studies on the role of the University Library. Future plans for bibliographic instruction may also benefit from this study. The focus of this study, therefore, is on students' assessment of their research strategies and effectiveness, not their assessment of the library's effectiveness. The author recognizes, however, that there may be a correlation between students' perceptions of their effectiveness and their perceptions of the library's effectiveness. The investigator also acknowledges that students' perceptions may not be the reality. However, the investigator assumes that their responses are an honest attempt to assess their abilities.

STUDY DESIGN AND METHODOLOGY

Study Design and Validity

This study resulted from a request by the acting dean of the library for an investigation into students' use of library resources in order to plan future programs and services. According to Doris Schlichter and J. Michael Pemberton, "Planning and evaluation are not independent processes. Analysis of users' needs and measurement of the effectiveness of programs and services provide the data upon which rationalized future plans of the library must be based."[1] Thus, the objectives of this study were:

- to identify students' perceived effectiveness in identifying, locating, selecting, and using the University Library resources;
- to assess students' reasons for satisfaction or dissatisfaction in their search for information and resources at the University Library; and
- to analyze what students need to improve their effectiveness in the use of the University Library resources.

To measure these three objectives adequately, the investigator designed and tested a questionnaire. After pretesting the survey and consulting with both the acting dean of the library and the acting director of the library, the questionnaire

was revised to eliminate ambiguous language and to provide a more efficient layout. Research investigations show that user studies employing the survey method may not produce useful data for planning unless the design of the survey asks what is intended and the questions are straightforward.[2] After revising the questionnaire and testing for validity, the instrument appeared to measure what was intended—users' success, satisfaction, and expectations.[3]

After an analysis of user studies, Douglas L. Zweizig proposed that measuring user satisfaction is probably a better alternative than measuring the benefits of material availability and information obtained.[4] Thus, the user survey asked students to evaluate the degree of their effectiveness for each step of the research process: searching (question 5), identifying (question 7), locating and selecting (question 9), and using materials (question 11). Questions 6, 8, and 12 asked students if they were satisfied with each step of their search and why or why not. Question 13 asked students to explain what would help them to become more effective users of the library's resources. (Copies of the user survey and the coding sheets are available from the author.)

Data Collection

During the last two weeks in April 1993, the principal investigator along with a graduate assistant, distributed 1,800 questionnaires for approximately two hours each day to students entering the library.[5] An attempt was made to ask each student entering the library to take a survey and to return it in the questionnaire box upon leaving. The time of the visits varied in order to obtain a wide distribution of students. During this two-week period, 681 library users returned their surveys in the box. Only one was eliminated for failure to answer any questions. Of the remaining surveys, 608 student responses were coded and tabulated, while 72 faculty or others were coded but not tabulated. Thus, the return rate was more than one-third of the total surveys distributed.

The data results reflect the population of students who use the library. The concerns of nonusers, therefore, were not considered. In April 1993 there were 10,800 registered University Library borrowers out of a student population of approximately 14,000, a faculty of 750, and a staff of 2,000.

Methodology, Quality of Data, and Reliability

While the survey method was used to collect data, both quantitative and qualitative means were employed to analyze the data. A graduate assistant hand coded the quantitative data. The statistical computer program PC/SAS performed frequency counts, percents, and chi-square tests by comparing sets of data to determine significance.[6] The principal investigator performed a content analysis on the open-ended questions by creating coding schemes identifying categories of reasons given for satisfaction, dissatisfaction, and for needs. To ensure intercoder reliability, the graduate assistant and the principal investigator reviewed each other's coding. The principal investigator, however, analyzed and interpreted all the results. (Copies of the frequency counts coding sheets are available from the author.)

Content analysis was chosen to analyze data because of its advantage in making inferences by objectively and systematically creating categories from specified characteristics of responses.[7] A quantitative content analysis enabled the investigator to identify, count, and rank order categories of responses and assess students' common traits or problems with their search strategies. In addition, with a qualitative content analysis the investigator can offer insights into students' reasons for satisfaction or dissatisfaction, and their expectations to improve effectiveness. The investigator could make valid inferences and draw conclusions from students' responses while moving between the quantitative and the qualitative content analysis, thereby gleaning an insight into the full meaning of the data.[8]

Utility of Study

The data results are interpreted as the beginning stage of an ongoing evaluation of the University Library's resources and services to evaluate how effectively the library meets the information needs of its community. Upon completion of this investigation, the library staff was given a draft of this study and invited to discuss the implications for future planning and evaluations. Peter Hernon and Charles McClure identify the importance of this type of evaluation research to help maintain an effective and efficient organization:

> Evaluation should incorporate planning, research, and change. Wanting to make changes is a necessary prerequisite for professional development, the meeting of organizational goals and objectives, and satisfying the information needs of current and potential clientele in a timely and comprehensive way.[9]

INTERPRETATION OF DATA

User Satisfaction and Dissatisfaction (Questions 6, 8, and 12)

Paradoxically, though 88 percent of respondents (488 out of 552) indicated success in identifying materials (question 6) and 82 percent of respondents (453 out of 552) indicated success in locating and selecting materials (question 8), only 60 percent of respondents (332 out of 550), indicated satisfaction with their search for information and materials found (question 12) (see table 1). Why do students indicate an almost 25 percent decrease in overall satisfaction with

TABLE 1
TABLE OF STATUS BY USER SATISFACTION

Question 12: "Were You Satisfied with Your Search for Information and the Material(s) Found?"

	User Satisfaction or Success		
Status (Class Year)	0–No Not Satisfied	1–Yes Satisfied	Row Total
Graduate			
Frequency	49	79	128
Percentage	9	14	23
Row percentage	39	62	
Column percentage	22	24	
Upper			
Frequency	111	162	273
Percentage	20	30	50
Row percentage	41	60	
Column percentage	51	49	
Lower			
Frequency	58	91	149
Percentage	10.5	16.5	27
Row percentage	39	61	
Column percentage	27	27	
Column total	218	332	550
Column percentage	40 Not satisfied	60 Satisfied	100

	Statistics for Table 1–Status by Satisfaction or Success		
Statistic	*DF*	Value	Probability
Chi-square	2	0.249	0.883
Likelihood ratio chi-square	2	0.249	0.883
Phi coefficient		0.021	

their search for information and materials found?

By analyzing the reasons offered by students for both satisfaction and dissatisfaction in their searches, the investigator gleaned an insight into students' rationales. Although there were a total of 1,273 yes responses for satisfaction in questions 6, 8, and 12, only 151 reasons were given for satisfaction. More than twice as many reasons were given for dissatisfaction, however, with 330 reasons offered from a total of 381 no responses for these questions. Thus, 87 percent of students who were dissatisfied with their search gave reasons for their discontent, while only 12 percent of those who were satisfied gave reasons for their satisfaction. Perhaps, when students checked yes for satisfaction on these questions, they thought that the reason was obvious: I succeeded at the task. On the other hand, students who checked no wanted to express their reasons for dissatisfaction in hope that the library would make changes. The following scenario illustrates students' desires for action. Two pharmacy students hand delivered their surveys to the investigator and asked whether the library staff would consider their request for more journals. They asked: "Will the library respond to our recommendations? We know how to research, but we need more current pharmacy journals in order to do our research."

The investigator combined reasons given for satisfaction in questions 6, 8, and 12 and collapsed them into five major categories with frequency counts, percents, and rank order under "Satisfaction" in table 2. In addition, reasons given for dissatisfaction in questions 6, 8, and 12 were also combined and classified into ten major categories with frequency counts, percents, and rank order under "Dissatisfaction" in table 3.

TABLE 2
RANK ORDER "SATISFACTION"

Reasons Given for Yes to Questions 6, 8, and 12	Frequency Count	%
1. Located materials needed	49	32
2. Used computer (HELIN or CD-ROM)	46	30
3. Satisfied with information or resources found	35	23
4. Received help from staff	15	10
5. Completed assignment	6	4
Total	151	99

TABLE 3
RANK ORDER "DISSATISFACTION"

Reasons Given for No to Questions 6, 8, and 12	Frequency Count	%
1. Lack of materials at URI (books or current materials)	71	22
2. Unable to find enough materials (missing or not on shelf)	65	20
3. Lack of journals wanted on topic (not at URI)–ownership	62	19
4. Unable to find journals (not on shelf, not available, missing, or mutilated)	61	18
5. Search process too long, too confusing, or too difficult	24	7
6. Need more reference staff or staff help	11	3
7. Could not identify sources on topic*	11	3
8. Can not find books listed in HELIN (Not on shelf or not at URI)	10	3
9. Library materials are disorganized*	10	3
10. Need faster or better ILL service	5	2
Total	330	100

*Denotes tie with item above.

The number one reason given for satisfaction was simply, "I got what I needed" or "I found what I wanted." Students also indicated contentment with the quality of materials found (reason number three). Evidence cited for satisfaction with the quality and quantity of materials found include comments such as, "diverse information and good quantity," "fairly comprehensive coverage of information," and materials found "pertained well to my topic." Thus, by combining reasons number one and three, more than half of all responses given for satisfaction were ease in locating materials and contentment with the quality and quantity of materials found.

The second highest reason cited for satisfaction is the use of computers to help find information resources. Thirty percent of the written responses for satisfaction praised CD-ROM databases and HELIN. Comments included, "HELIN is GREAT," and "CD-ROM and HELIN, especially [are the] best addition to the library." Satisfaction with computer access seems, paradoxically, to increase students' expectations for more computer services and better access to materials. One student suggested that although "I found some of what I needed, a lot mentioned in HELIN [was] not available at URI." Another student recommended that the library should add computer "online request for books and Gopher service in [the] library building." Others requested more computer terminals, more CD-ROM databases, and more online services. Students using CD-ROM databases indicated satisfaction with their serial citations, but dissatisfaction with a lack of journals at URI. Several users of MEDLINE claimed they were dissatisfied with a lack of medical and science journals to match their citations. One student wrote, "This library didn't have any of the articles/journals listed in computer [database-MEDLINE], had to go to Brown." Another user praised search results using several computer databases: HELIN, MEDLINE, Applied Science & Technology, and ABI, but complained, "once [I] got the references, it was difficult to obtain journals & books in [the URI] library."

Moreover, 10 percent of satisfied students indicated that the reason they succeeded was because of staff assistance. Students commented that they "used staff help" or "asked staff guidance" to get the information or sources they needed. The remaining 4 percent of satisfied students stated that they were pleased merely to complete their assignments.

Satisfaction with computer access seems, paradoxically, to increase students' expectations for more computer services and better access to materials.

Coincidentally, the major reasons given for dissatisfaction correlate with the major reasons given for satisfaction. While 55 percent of students claimed satisfaction with locating materials and with the quality and quantity of materials they found, 42 percent of students claimed dissatisfaction because of their inability to find materials and because of the lack of materials available. Journals were cited as the item most frequently missing or not available at URI. Nineteen percent expressed discontentment with the lack of journals. In addition, 18 percent expressed frustration with their inability to find journals or articles because they were missing, misshelved, mutilated, or not on the shelf. By combining these top four reasons, nearly 80 percent of the dissatisfied students were discontent because of a lack of materials or journals and their inability to find materials or journals needed. Moreover, what appears to please students most—the ability to find materials and the quality and quantity of materials found—also appears to displease students most—the inability to find materials and the lack of resources needed.

Although 10 percent of the satisfied students received help from the staff, 13 percent of the dissatisfied students indicated a need for more staff assistance. By combining three categories for dissatis-

faction (search process too difficult, need more staff assistance, and could not identify sources) into one explanation, the investigator inferred that 13 percent would benefit from more instruction or staff assistance in their search process. If more staff were available to assist students or to teach them, then students might be able to clarify their own needs and locate appropriate resources while increasing their satisfaction and skills using the library. Some students blamed the staff for being unresponsive; however, others claimed that the library was understaffed, especially in the evening. One comment illustrates a plea for help, "What we need is more staff members to assist in the [research] process."

Although there is not a statistically significant difference in the degree of effectiveness, it appears that graduate students are more confident in their skills to search and use library resources while lower division undergraduates appear less confident in their skills.

Other reasons cited for discontent were: cannot find books listed in HELIN (3 percent) and need faster or better interlibrary loan (ILL) service (2 percent). While 30 percent of the students expressed satisfaction with the new computers, 3 percent claimed frustration with computers because of their inability to find materials listed in HELIN. "Some materials [are] not on shelf, but should have been, according to HELIN," wrote one student. Students commented that, although they identified citations from CD-ROM databases, the journals either were not available at URI or that they were unable to find them: "I found the information from CD-ROM with no problem, but the journal articles weren't available." One inference seems plausible: once students' identify citations from the computer databases (HELIN or CD-ROM), they expect all of the materials (books and journals) listed in the computers to be available at URI, whether the library owns them or not. Moreover, they desire access to these materials either online or via document delivery. They also requested online access to ILL via the computer terminal. Although no one suggested the virtual library, dormitory delivery, or robotics retrieval, requests were made for more online access to library materials from remote areas. In addition, 2 percent complained that library materials are disorganized. These responses may relate to the construction moves, temporary shelving, or misshelving. Some students commented that materials, especially journals on the lower level, should be reshelved faster and missing or mutilated articles should be replaced.

User Effectiveness (Questions 5, 7, 9, and 11)

A comparison of student status (class year) by user effectiveness in questions 5, 7, 9, and 11, shows that regardless of task or class year, when it comes to seeking and using library resources, approximately 65 percent of all students believe that they do it well. Surprisingly, there was no significant difference among class year and effectiveness as evidenced by the chi-square test where the value did not exceed the expected ratio for each of these questions. The phi coefficient, which measures the strength of a relationship, approximated the value of zero in each case, thereby demonstrating that there is no association or correlation between class year and students' perceived ability to search, identify, locate, select, and use library resources.

Before tabulating these results, class years were collapsed into three groups in order to create valid contingency tables where the cells had a value of at least five. Freshmen and sophomores were grouped under the status "lower" representing lower division undergraduates. Juniors and seniors were combined under the status "upper" representing upper division undergraduates. Master and Ph.D. candidates were grouped as "graduate" students. Faculty and others were not tabulated. Half of the total respondents were upper division undergraduates, while approximately

one-quarter were lower division undergraduates and the remaining quarter were graduate students. Thus, there was an adequate representation of each of the class years. The levels of effectiveness were collapsed into three categories: high (4 and 5), fair (3) and low (2 and 1). By comparing the degree of effectiveness, similar patterns emerge for each question. The ratios for each question are surprisingly constant, except for an increase of 20 percent in question 11 (effectiveness in using materials).

Students responded to question 5 ("rate your effectiveness in searching and using the resource(s) checked in question 4") with 65 percent rating their effectiveness high (good or excellent) compared with 25 percent fair, and 9 percent low (poor or needs training) (see table 4). Students responded to question 7 ("rate your effectiveness in identifying material(s) for your information need") with 70 percent rating their effectiveness high, compared with 23 percent fair, and 7 percent low (see table 5). Similarly, when students responded to question 9 ("rate your effectiveness in locating and selecting materials"), 66 percent rated their effectiveness high, compared with 24 percent fair, and 10 percent low (see table 6). Thus, in all three questions there appear only slight differences in the de-

TABLE 4
TABLE OF STATUS BY SEARCH EFFECTIVENESS

Question 5: "Overall, How Would You Rate Your Effectiveness in Searching and Using the Resource(s) Checked in Question 4?"

	User Effectiveness in Searching					
	Low (1 and 2)		Fair	High (4 and 5)		
Status (Class)	1 Need Help	2 Poor	3 Fair	4 Good	5 Excellent	Row Total
Graduate						
Frequency	5	8	19	65	39	136
Percentage	0.82	1.32	3.12	10.69	6.41	22.37
Row percentage	3.68	5.88	13.97	47.79	28.68	
Column percentage	19.23	26.67	12.50	23.55	31.45	
Upper						
Frequency	14	12	84	136	61	307
Percentage	2.30	1.97	13.82	22.37	10.03	50.49
Row percentage	4.56	3.91	27.36	44.30	19.87	
Column percentage	53.85	40.00	55.26	49.28	49.19	
Lower						
Frequency	7	10	49	75	24	165
Percentage	1.15	1.64	8.06	12.34	3.95	27.14
Row percentage	4.24	6.06	29.70	45.45	14.55	
Column percentage	25.92	33.33	32.24	27.17	19.35	
Column totals	26	30	152	276	124	608
Percentage	4.28	4.93	25.00	45.39	20.39	100
Combine column totals	1 and 2 (Low)		3 (Fair)	4 and 5 (High)		
Frequency	56		152	400		608
Percentage	9		25	66		100

	Statistics for Table 4—Status by Search Effectiveness		
Statistic	*DF*	Value	Probability
Chi-square	8	17.894	0.022
Likelihood ratio chi-square	8	18.863	0.016
Phi coefficient		0.172	

gree of effectiveness in comparison to class status.

Graduate students had the highest percentage of high ratings in questions 5, 7, and 9 while lower division undergraduates had the highest percentage of fair and low ratings. Although there is not a statistically significant difference in the degree of effectiveness, it appears that graduate students are more confident in their skills to search and use library resources while lower division undergraduates appear less confident in their skills. Moreover, with approximately thirty-five percent of all respondents identifying their effectiveness as fair or low, a significant number of students appear to need help. Thus, it seems important to this investigator to identify what students need to succeed so that the library can plan accordingly.

Question 11 ("Rate your effectiveness using the material(s) found") had the highest rating with 86 percent of all students rating their effectiveness high, compared with 11 percent fair and 3 percent low (see table 7). Apparently, once students have found materials, they seem confident in their ability to use them effectively. Statistically there was no significant difference among class status. Thus, assessing the responses to question 13 provides insight into what students expect in order to become more effective users of library resources.

TABLE 5
TABLE OF STATUS BY EFFECTIVENESS IN IDENTIFYING SOURCES

Question 7: "How Would You Rate Your Effectiveness in Identifying Material(s) for Your Information Need?"

	User Effectiveness in Identifying Sources					
	Low (1 and 2)		Fair	High (4 and 5)		
Status (Class Year)	1 Need Help	2 Poor	3 Fair	4 Good	5 Excellent	Row Total
Graduate						
Frequency	0	4	23	66	40	133
Percentage	0	0.70	4.02	11.54	6.99	23.25
Row percentage	0	3.01	17.29	49.62	30.08	
Column percentage	0	22.22	17.42	22.00	39.22	
Upper						
Frequency	12	9	66	158	44	289
Percentage	2.10	1.57	11.54	27.62	7.69	50.52
Row percentage	4.15	3.11	22.84	54.67	15.22	
Column percentage	60.00	50.00	50.00	52.67	43.14	
Lower						
Frequency	8	5	43	76	18	150
Percentage	1.40	0.87	7.52	13.29	3.15	26.22
Row percentage	5.33	3.33	28.67	50.67	12.00	
Column percentage	40.00	27.78	32.58	25.33	17.65	
Column totals	20	18	132	300	102	572
Percentage	3.50	3.15	23.08	52.45	17.83	100
Combine column totals	1 and 2 (Low)		3 (Fair)	4 and 5 (High)		
Frequency	38		132	402		572
Percentage	7		23	70		100

	Statistics for Table 5—Status by Effectiveness Identifying Sources		
Statistic	*DF*	Value	Probability
Chi-square	8	26.153	0.001
Likelihood ratio chi-square	8	29.123	0.000
Phi coefficient		0.214	

TABLE 6
TABLE OF STATUS BY EFFECTIVENESS IN LOCATING & SELECTING SOURCES

Question 9: "How Would You Rate Your Effectiveness in Locating and Selecting Material(s)?"

	User Effectiveness in Locating and Selecting Sources					
	Low (1 and 2)		Fair	High (4 and 5)		
Status (Class Year)	1 Need Help	2 Poor	3 Fair	4 Good	5 Excellent	Row Total
Graduate						
Frequency	0	7	23	68	31	129
Percentage	0	1.23	4.05	11.97	5.46	22.71
Row percentage	0	5.43	17.83	52.71	24.03	
Column percentage	0	17.50	17.04	24.55	31.63	
Upper						
Frequency	11	19	64	141	49	284
Percentage	1.94	3.35	11.27	24.82	8.63	50
Row percentage	3.87	6.69	22.54	49.65	17.25	
Column percentage	64.71	47.50	47.41	50.90	50.00	
Lower						
Frequency	7	14	48	68	18	155
Percentage	1.24	2.46	8.45	11.97	3.17	27.29
Row percentage	4.52	9.03	30.97	43.87	11.61	
Column percentage	35.29	35.00	35.56	24.55	18.37	
Column totals	18	40	135	277	98	568
Percentage	3.17	7.04	23.77	48.77	17.25	100
Combine column totals	1 and 2 (Low)		3 (Fair)	4 and 5 (High)		
Frequency	58		135	375		568
Percentage	10		24	66		100

	Statistics for Table 6—Status by Effectiveness in Locating and Selecting Sources		
Statistic	*DF*	Value	Probability
Chi-square	10	22.048	0.015
Likelihood ratio chi-square	10	25.616	0.004
Phi coefficient		0.197	

Students' Expectations (Question 13)

Students' responses to question 13 ("What would help you to become more effective in using the resources of the University Library?") were coded into nine categories then identified, counted, and rank ordered by the investigator. Interestingly, students tend to recommend improvements in library resources, services, and staff, rather than identify areas for their own growth or improvement in skills. They tend to blame the library's resources and staff for their ineffective searches rather than identify their own inadequacies in using library resources.

Forty percent of the students believe that they could become more effective users of the library if the library had better organization and availability of materials, and more materials (see reasons one and three in table 8). Students seem more concerned with improvements in library resources than with improvements in their own skills. One student claimed, "You are asking the wrong question. I'm O.K., but the library needs to improve."

Thirty-five percent of the students claimed that the library needed to provide more training sessions and more staff assistance if students were to be-

TABLE 7
TABLE OF STATUS BY EFFECTIVENESS IN USING SOURCES FOUND

Question 11: "How Would You Rate Your Effectiveness in Using the Material(s) You Found?"

	User Effectiveness in Using Sources Found					
	Low (1 and 2)		Fair	High (4 and 5)		
Status (Class Year)	1 Need Help	2 Poor	3 Fair	4 Good	5 Excellent	Row Total
Graduate						
Frequency	2	1	10	75	39	127
Percentage	0.35	0.18	1.77	13.27	6.90	22.48
Row percentage	1.57	0.79	7.87	59.06	30.71	
Column percentage	25.00	9.09	16.13	22.26	26.53	
Upper						
Frequency	5	5	34	164	77	285
Percentage	0.88	0.88	6.02	29.03	13.63	50.44
Row percentage	1.75	1.75	11.93	57.54	27.02	
Column percentage	62.50	45.45	54.84	48.66	52.38	
Lower						
Frequency	1	5	18	98	31	153
Percentage	0.18	0.88	3.19	17.35	5.49	27.08
Row percentage	0.65	3.27	11.76	64.05	20.26	
Column percentage	12.50	45.45	29.03	29.08	21.09	
Column totals	8	11	62	337	147	565
Percentage	1.42	1.95	10.97	59.65	26.02	100
Combine column totals	1 and 2 (Low)		3 (Fair)	4 and 5 (High)		
Frequency	19		62	484		565
Percentage	3		11	86		100

	Statistics for Table 7—Status by Effectiveness in Using Sources Found		
Statistic	*DF*	Value	Probability
Chi-square	8	8.469	0.389
Likelihood ratio chi-square	8	8.842	0.356
Phi coefficient		0.122	

come more effective users of library resources (see reasons two and four on table 8). One respondent said that the library should require a "mandatory reference course for newcomers—our gym facility mandates one—why shouldn't the library?" Some students would like classes tailored to their subject interests while others recommended general orientation sessions scheduled periodically so students can learn "everything" in the library and how to use it. Several students requested training sessions on HELIN and CD-ROM databases to learn search strategies. One student asked: "Why not publicize a schedule of training sessions or classes in the *Cigar* [the student newspaper] so students will know when the library is offering programs?"

The fourth highest request was to increase the staff and provide more staff assistance. Twelve percent of the students stated that the library was either understaffed or the present staff was not accessible enough for students. Some commented that during busy times, especially in the evening, there is never enough help at the reference desk. Others want staff assistance on each level, especially the lower level, to help students locate journals.

TABLE 8
RANK ORDER: EXPECTATIONS TO BECOME MORE EFFECTIVE USERS

Question 13: "What Would Help You Become More Effective in Using the Resources of the University Library?"

Reasons Given for Question #13 and Additional Comments	Frequency Count	%
1. Better organization and availability of materials (reshelve journals, replace missing volumes or mutilated journal articles)	111	28
2. More training, tours, classes, or more practice and skill in using library resources	90	23
3. Buy more materials—journals, books, videos	47	12
4. Need more staff and more staff help	46	12
5. Better signage, maps, guidelines, handouts or location (on computer)	45	11
6. Improve computer facilities—more access, printers, better databases and cross-references, including CD-ROMs and periodical holdings online, and combine HELIN and CD-ROM	36	9
7. Better and faster ILL or send HELIN materials	9	2
8. Better access to materials	7	2
9. More and better working copy machines	4	1
Totals	395	100

Better signage (i.e., maps, guidelines, handouts, and highlighting locations on the computer terminal) was requested by another 11 percent of the students. In fall 1990 investigators performed an evaluation of signs at the University Library. The investigators concluded that although they did not have enough data to make statistical inferences, signs could be more effective if simple, straightforward, and unambiguous in communicating location, especially for new users trying to find specific items. The investigators acknowledged that new signs were needed at URI and would be included with the construction project. They also recommended an evaluation of signage upon the completion of the construction project.[10] When an evaluation of signage is redone, users may show an increased satisfaction with the new signs in helping them to locate materials in the larger and better designed facility.

With the advent of the computer terminals in this newly refurbished facility, students seem to express a desire for better and faster access to materials. Thus, students requested more computer services in the library. Nine percent of the students indicated that they would like expanded computer facilities in the library. Students seem to expect the computers to both simplify and speed up their search process. After identifying books or serial citations, students complained about seeking materials: "I found what I needed in the computer, but now I have to find whether the library has them and where they are located." Students also complained about having to verify citations in the serial holdings "red book" for call numbers and then having to go to the basement to search for journals. They asked, "Why can't the red book be online?"

Some suggestions for improving computer facilities reveal both students' sophistication and their naivete with regard to the technology. Some students asked if HELIN and CD-ROM databases could be merged with one interface to provide access to all holdings on one computer, including serials and the full text of journal articles. Students wanted to know why the CD-ROM databases gave citations for journals that the URI Library did not own. Several students

requested more computer terminals on each level as well as printers. One student admitted that s/he wanted a printout of citations from HELIN because "I'm to lazy" to write them down. Furthermore, students asked for better database access with cross references and the ability to do online searching on the Internet using the HELIN terminals. Along with the expectation for improved computer facilities, students requested better and faster ILL, with online ILL access for items from the other academic libraries in HELIN. Some students complained that ILL requests take too long and if they need materials, then they have to drive to other libraries in Rhode Island to retrieve them. Students also complained that they were not notified of the status of ILL materials or of recall books.

Moreover, students requested better access to materials and better working copy machines. Some individuals asked for more creature comforts such as couches, less heat, and completion of the construction project. One student commented that s/he would become more effective using the library by "never join[ing] the Greek system . . . [then] I would have to use my brain more often." Another student claimed "less procrastination" would help. These isolated responses do not appear in the rank order in table 8. However, this investigator observed that students who procrastinate until the end of the semester in beginning their search for sources become easily frustrated with the library. Students expect to find library resources quickly with the use of computer databases or with the help of the staff. They also want to find the materials they need readily available on the shelf.

CONCLUSIONS

How effective are students in using university library resources? Based on students' perceived abilities to search and use university library resources, most students believe that they can use library resources effectively. While 86 percent of the total students perceive that they can use materials effectively, only 60 percent, however, are satisfied with their search for information and the materials found. Why were 40 percent of the students dissatisfied with their search process and what do they need to become more productive users?

Students expect to find more materials on the shelf when they need them. They also recognize that they need more help in using the library, and thus requested training sessions or classes. They specifically identified the need to learn effective search strategies on HELIN and CD-ROM databases. Students would like more assistance from staff and more accessibility to staff. In addition, they would appreciate better signage to communicate not only location but also to provide guidance while searching. Students would like enhancements to computers for better access to collections by combining HELIN and CD-ROM databases with one interface, including serials holdings. One student seemed to say it all when s/he said that in order for students to become more effective users of library resources: "Get the library finished, fully staffed, and immensely funded."

The library construction was completed and a ribbon-cutting ceremony was held in September 1993. Now it appears that the other two pieces are needed to fulfill students' expectations in this state-of-the-art-facility: a fully staffed library and an increased budget to improve holdings. Whether the library can maintain its current level of services with a reduced staff and a diminished budget is doubtful. The dilemma of increased expectations for more technology, materials, training, and staff, without an increase in budget, remains a problem. Requests for expanded library instruction and more user services may require a shift in personnel. The current level of individual instruction provided at point-of-need requires more reference staff than is currently available to teach students on a one-to-one basis. Recent studies indicate that in order for academic reference services to work, academic libraries need organizational change and rethinking of reference services.[11]

It is apparent that if students are to improve their effectiveness, they need more instruction to become more skilled using library resources. In order for this to occur, the library needs more public services staff and a rethinking of reference services. It is recommended that the library assess its current reference services and instruction program in light of students' curriculum needs and skills. Furthermore, it is recommended that the library identify what training sessions are needed in order for students to improve their skills and adequately complete their research assignments.

A reassessment of current library staff and services could help identify programming, staffing, and budgeting needs to expand programs in public services. Workshops and training sessions on search strategies using HELIN and CD-ROM databases are recommended in addition to the current freshmen orientation sessions for Writing 101. Hands-on workshops for CD-ROM database searching by subject could help both faculty and students become better acquainted with the new library resources and the technology as well as relieve library anxiety. Whether this can become a reality at the University of Rhode Island is uncertain, unless the public services staff wants to assess current services and offer expanded programs. Also, the university needs to make a continued commitment to the library budget in order to enhance materials collection and to replace unfilled staff positions.

EPILOGUE

One year after this study, the budget and staff levels at the University Library remain the same, but future plans are ongoing for evaluating library services. As a result of this study, the investigator and the head of Reference Services are preparing to offer and to assess CD-ROM workshops and hands-on training sessions to evaluate students' search strategies. Both participant evaluation surveys and observation methods will be used to evaluate students' success in searching. This joint investigation is in direct response to students' requests in this study for training in CD-ROM database searching. Thus, with another study the library can continue to evaluate, plan, and improve services at the University Library to better serve the information needs of the university community.

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Government Information Expert Systems: A Quantitative Evaluation

John V. Richardson Jr. and Rex B. Reyes

In this article—the first published quantitative evaluation of knowledge-based systems (KBS) or so-called expert systems—the authors quantitatively compare and contrast two systems: POINTER and Government Documents Reference Aid (GDRA). In a test based on fifteen typical U.S. government document reference questions about the federal level of government, POINTER answered 65 percent of the questions correctly while GDRA answered only 37 percent correctly. An analysis of keystroke efficiency revealed that POINTER required 120 strokes in the reference interview and 60 for the question negotiation phase while GDRA needed 120 keystrokes in the reference interview but only 45 during its question negotiation. The discussion and implication section should help developers of knowledge-based computer systems focus their future activities in this area and reassure human reference librarians who work with government information that these systems still have a way to go before they are truly competent systems. Nonetheless, the first generation of expert systems for depository libraries could already be playing a widespread, if modest, role in assisting with federal level reference questions.

Writing in 1964, Jesse Shera argued that the "fullest utilization of the potential of automation [such as expert systems in reference work] necessitates a thorough study of the total reference process—from the problems that prompt the asking of a question to the evaluation of the response."[1] Hence, the overarching goal of the following study is to contribute to the profession's understanding of the total process by evaluating reference question responses in the field of government information.

There are several microcomputer knowledge-based or so-called expert systems whose coverage includes the field of government information. Of the systems that specifically emphasize this area of specialization, the best known is POINTER, which was developed by Karen F. Smith at SUNY, Buffalo, in 1984. Four years later on the West Coast, Bruce Harley and Patricia Knobloch developed Government Documents Reference Aid (a.k.a. GDRA) at Stanford University. In each case, the computer system attempts to answer reference questions much the way a government documents specialist

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might—by referring the user to a single source or even several sources that are thought likely to contain the answer. To the best of the authors' knowledge, these are the only available systems in government information.[2]

Although the first of these computer systems has been extant for ten years, no one has examined systematically the quality or accuracy of these systems. Harley and Knobloch infer that their system is expert while Smith is careful to qualify user expectations of her system: "POINTER is not an expert system. POINTER is a computer-assisted reference program—inspired by expert system developments of the recent past, and aspiring to be upgraded to a real expert system in the future."[3] Nonetheless, it is not clear how much assistance users can expect from these systems nor how much future development work may be necessary for these systems to be truly expert in the human sense.

Hence, the authors believe that a quantitative evaluation of the quality of these extant systems needs to be undertaken. To the best of their knowledge, no such published study exists; hence, this article is an original contribution to understanding the nature of expertise in these systems. As a result, the authors have established a method for benchmarking these systems for the first time. Using this methodology, readers can judge for themselves the technological promise of expert systems.

SYSTEMS, EVALUATION ISSUES, AND GENERAL REFERENCE STUDIES

To keep this research project within manageable limits, the scope of this study involves the following three dimensions: (1) the extant microcomputer systems, (2) evaluation issues, and (3) thirty years of reference quality studies.

Extant Microcomputer Systems

An expert system can be defined as: "a program that relies on a body of knowledge to perform a somewhat difficult task usually performed only by a human expert. The principal power of an expert system is derived from the knowledge the system embodies rather than from search algorithms and specific reasoning methods. An expert system successfully deals with problems for which clear algorithmic solutions do not exist."[4] The basic assumption underlying expert systems is the idea that "Knowledge Is Power."[5]

The quality of a knowledge-based system, much like human reference work, can be measured by a variety of factors, such as speed of response, subjective short- or long-term user satisfaction, the interface design (paralleling the question negotiation phase of the reference transaction), and, of course, the accuracy of responses.

As mentioned above, there are two expert systems that focus on the field of government information: (1) POINTER and (2) Government Documents Reference Aid (GDRA). For the purposes of subsequent discussion, the authors prefer the phrase *knowledge-based systems* because it more accurately describes the state of the art at this point.

POINTER.[6] Developed between 1984 and 1987 by Karen F. Smith, documents librarian at the Lockwood Library of SUNY, Buffalo; Stuart Shapiro, a SUNY Buffalo faculty member; and Sandra Peters, a computer science student, this system was originally written in LISP for a VAX minicomputer. It now runs on an IBM PC with a minimum of 256K RAM and a disk drive; there are 6,000 lines of BASIC code. The program is menu-driven and includes about 130 screens of text.

The work of the program developers is based on an analysis of 1,071 queries in the university library's documents department, and took four months to develop with a $6,000 investment, including a $3,000 Council on Library Resources' Faculty and Librarian Cooperative Research Grant.[7] The perceived benefits of this particular system are twofold: (1) a solution to lack of staff, and (2) a training tool for student assistants and clerical

staff. User interaction (i.e., the reference interview) with POINTER begins with a welcome screen, asking whether the user wants to continue. If the user types yes or y, the next screen describes the organization of their collection according to the SuDoc classification scheme. The system asks the user if s/he has a SuDoc number; the three acceptable responses are: yes, no, or unsure. "Yes" refers the user directly to the collection. "No" or "Unsure" provides more information about SuDoc numbers to help the user decide if s/he has a SuDoc number. Strictly speaking, the interaction thus far is not part of question negotiation. Nonetheless, the system forces the user to answer these questions as part of the preliminary phase of the reference interview. Next, the user progresses to a menu screen with four options. This screen is the first in the real question negotiation phase. For the purposes of this study, the authors assume that the user does not have a SuDoc classification number. Question negotiation ends when the last screen of sources appears. The reference interview concludes after the user responds to the prompt "Do you have another question?" To exit the program, the user must press "control-break."

Government Documents Reference Aid (GDRA).[8] Created in 1988 by Bruce Harley and Patricia Knobloch, then of Stanford University Libraries (SUL), GDRA was developed on an IBM AT using Level 5 shell software, which employs production rules and backward chaining logic. The Payson J. Treat Fund provided $1,265 and its development required about four weeks. Its library environment is SUL and covers U.S. federal, state, and local as well as foreign and international (including United Nations) government publications.[9] Special features provide that "both ASCII text files and an external program are directly accessed. The external program, Samson, provides the telecommunications link to Socrates, SUL's online catalog, activated from with GDRA's rule structure."[10] There are four perceived benefits of GDRA: it "solve[s] the problem of increasing workload; contributes to the mainstreaming of government documents with SUL; helps train staff providing government documents reference service; and supplements existing government documents reference service."[11]

User interaction with GDRA progresses according to the following pattern: the Level 5 shell screen appears; six options, selected by using the arrow keys, are presented. Novices will not know where to start; however, Info, Intro, or Main Menu are the most obvious choices. The correct place is the introduction module; the authors consider the reference interview to start here. The Main Menu is where question negotiation starts. During the question negotiation phase, there is a compulsory information screen about "U.S. Federal Documents" that discusses the SuDoc shelving arrangement at Stanford. Question negotiation ends when all the sources appear (i.e., the screen labeled "Subject, Author, Title"). The reference interview ends when the user presses the "F2" function key to return to the welcome screen. The "F10" function key allows the user to exit GDRA.

Evaluation Issues

Naturally, the question arises: What constitutes a good system? The quality of a knowledge-based system, much like human reference work, can be measured by a variety of factors, such as speed of response, subjective short- or long-term user satisfaction, the interface design (paralleling the question negotiation phase of the reference transaction), and, of course, the accuracy of responses. In this study, the authors investigate two aspects of quality: efficiency and accuracy. Further, the authors defined efficiency as the number of keystrokes that the user has to type. Operationally, the authors defined accuracy as the percentage of questions correctly answered out of a set of fifteen test questions. In this respect, since the authors presume that these systems are serving as surrogates for real reference librarians, it seems reasonable that the competence of such systems should be addressed in this manner.

Thirty Years of Reference Quality Studies: The Theoretical Bridge

The authors knew only what the general nature and extent of the extant microcomputer-based systems in government information were, and they wanted to know more about their quality. What the authors needed was a link between the known and the unknown. Thus, they propose to model this study of machine-based reference work on the prior thirty years of human reference quality studies. Of course, there have been some difficulties in undertaking such studies of accuracy; notably, the literature does not report the most frequently asked government information questions.[12] Rather than undertake that subject as the focus of their work, the authors will adopt those questions that have already been worked out by other researchers. They assume that there is a kind of comparability with the studies of general reference quality because imbedded in many of their test questions are questions that, in fact, can be answered in documents departments and are documents-type questions.

KEY OBJECTIVES AND RESEARCH QUESTIONS

To be explicit, the three key research objectives of this article are: (1) to depict how well each knowledge-based system performs; (2) to compare and contrast each system; and (3) to test the null hypotheses laid out below. Logically, three research questions flow from these objectives: first, can the user get a correct answer from either POINTER or GDRA? Second, compared to each other, how well do POINTER and GDRA perform in percentage terms? Lastly, and most importantly, how well do they perform against reports of human reference experts?

Answers to these questions can help knowledge-based system developers focus their activities and provide a method of benchmarking the state of the art in knowledge-based systems for government information.

PROVISIONAL HYPOTHESES

The authors propose the following two hypotheses, one about the system's accuracy and the other which addresses its efficiency. Together these hypotheses address the quality issue of a knowledge-based system for answering requests for government information.

The Accuracy Hypothesis

There is no difference between the performance of these two knowledge-based systems and the reported literature accuracy rate of 52 to 65 percent success in real reference settings. The 13 percent variability occurs because unobtrusive studies have reported lower levels of success than obtrusive ones. Given the existence of this range, the authors contemplated establishing a similar confidence interval for these two knowledge-based systems under study by using strict or more liberal responses during each system's question negotiation session (see method section below).

More fundamentally, the authors believe that the present state of the art in this new technology is still first generation. While the authors are optimistic about the long-term future of this technology, they suspect that, at present, there is a serious need for further development work (essentially, more time and money needs to be spent in this area) for real results in knowledge-based systems that can deal with question answering.

The Efficiency Hypothesis

There is no difference in the efficiency between the two systems during the reference interview or question negotiation phase. As mentioned above, the authors defined *efficiency* as the number of keystrokes that the user had to type. By *reference interview* the authors mean the entire interaction with the knowledge-based system. The *question negotiation* phase is just the interaction which addresses the inquiry (i.e., not, as in POINTER, the background information on the SuDoc classification scheme or, as in GDRA, the description of the Stanford collection).

METHOD

This section addresses four concerns: (1) defining the population of test questions, (2) selecting a training set of three

questions and drawing a representative, random sample of test questions, (3) modeling the obtrusive nature of prior studies, and (4) evaluating system response and scoring.

Population of Test Questions

As mentioned above, the authors based their own evaluation of these two knowledge-based systems upon the more than thirty years of general reference quality studies.[13] From these numerous studies, the authors selected those that actually reported the real questions they used in measuring the quality of human reference service: Charles Bunge (1968), Thomas Childers (1971), Terry Crowley (1971), Jassim Jirjees (1983), Marcia Myers (1983), Charles McClure and Peter Hernon (1983 and 1987), and Kathy Way (1987).[14] Interestingly, only the reported studies of McClure and Hernon focused solely upon federal government publication–type questions. From the remaining studies, the authors identified just those questions which could be answered using federal level government publications. The final pool consisted of eighty questions.

Training Set and Random Sample

The authors trained together on a set of three randomly selected test questions (i.e., Hernon and McClure's number 1; Jirjees' number 3; and Myers' number 2; see appendix A). The design was to act as two independent judges, reviewing the quality of each system. The authors worked independently with each system and then came back together to compare their findings. When differences emerged in recording the results, the authors reached a consensus by discussing how they interpreted each system's prompts and then the authors agreed on the proper path (those questions are marked in appendix B with an asterisk to indicate their initial disagreement).

Next, the authors randomly selected a total of fifteen test questions devoted to the U.S. federal level based on each of the seven studies with each study proportionately represented.[15,16] In terms of difficulty (i.e., time to answer a question), the authors assumed that each question was of equal difficulty.[17]

Modelling Prior Studies: Liberal versus Conservative Approach

The authors considered the obtrusive versus unobtrusive nature of the previous reference studies. They finally adopted one approach to the knowledge-based system interface and its question negotiation. Using the set of fifteen test questions, the authors were generous in their analysis. This liberal approach would be similar to the way a familiar user of government publications would respond to the environment. Such a user is willing to use a computer, read an entire screen full of information, and thoughtfully select menu items after considering all the options. This approach is the best case scenario. It more closely models the obtrusive nature of the previous research on reference quality. The authors wanted to see how capable these knowledge-based systems are in answering questions accurately.

Evaluating System Response and Scoring

At the outset the authors reviewed the accuracy scoring methods that have traditionally been used. Historically, many of the previous studies of reference quality have scored the results as a dichotomous variable—either the question was answered or not (i.e., most report the percentage of correct answers).[18] Arguably, the ideal response for a fact-type question is a single source which contains the complete and correct answer. In this case, previous investigators often gave one point for the correct answer and no points for an incorrect one. Further, some used a test set of ten questions to make the math involved more straightforward. Obviously though, the real world of reference work is more complex than that—a range of responses is possible and extreme values can occasionally occur.[19] So more recent investigators such as Cheryl Elzy, Alan Nourie, Wilf Lancaster, and Kurt Joseph (1991)

have reconsidered this response variable; they implicitly recognize it as continuous.[20] In this study, the authors explicitly recognized the response range as continuous in developing their own scoring method (see table 1).

Next, the authors assigned point values, creating an eight-point response scheme and added qualitative judgments related to the level of service provided. In the authors' estimation, this scheme more adequately reflects reality. In fact, the above-named investigators agree with the authors that it would be appropriate to "give minus values to inappropriate referrals. . . ,"[21] but they did not do so in their particular study. The present authors do so because they believe that wrong answers significantly penalize users and create ill will. Hence, the authors' method does not artificially restrict the range of responses and takes into consideration the possibility of extreme values as well.

Finally, to measure efficiency, the authors counted keystrokes for both systems. They counted the total number of keystrokes from the beginning to the end of the interaction as the "reference interview." They counted the prompt "Do you have another question?" as the end of the reference interview for POINTER; for GDRA, the reference interview ended when the F2/F3 option appears allowing the user to start at the beginning or just at the Main Menu. For question negotiation, the authors started from the numbered menu option in POINTER and from the Main Menu in GDRA. They did not count the compulsory information screen in GDRA nor did the authors count the offer of help with the SuDoc classification scheme in POINTER. Statistical analysis was supported by SAS, Version 6.08, running on an IBM Series 9000/900 mainframe. During data screening, a univariate analysis confirmed: (1) data points are not missing, (2) data are not demonstrably nonnormal (as measured by skewness and kurtosis of less than two for the experimental variables), and (3) no data outliers except as discussed below.[22]

FINDINGS

The authors can confidently answer their first research question straight away—yes, the user can get a correct answer some of the time. However, the systems vary in their ability to do so.

TABLE 1
TAXONOMY OF SYSTEM'S POTENTIAL RESPONSES

Score	Range of System's Response	Service Quality
5.0	Referred to a single source, complete and correct answer	Excellent
4.0	Referred to several sources, one of which gave complete and correct answer	Very good
3.0	Referred to a single source, none of which leads directly to an answer but one of which serves as a preliminary source	Good
2.0	Referred to several sources, none of which leads directly to an answer but one of which serves as a preliminary source	Satisfactory
1.0	No direct answer; referred to specific person/institution	Fair/poor
0.0	No answer; no referral (e.g., I don't know)	Failure
-1.0	Refered to a single inappropriate source	Unsatisfactory
-2.0	Referred to several sources, none of which answers	Most unsatisfactory

Source: Suggested by Gers and Seward (1985) and Elzy, Nourie, Lancaster, and Joseph (1991).

TABLE 2
SCORING OF POINTER AND GDRA ON THE FIFTEEN TEST QUESTIONS

Question	Pointer's Score	GDRA's Score	Total Possible
1.	4	2	5
2.	2	2	5
3.	2	2	5
4.	4	2	5
5.	4	2	5
6.	3	3	5
7.	2	2	5
8.	2	2	5
9.	4	2	5
10.	4	2	5
11.	2	2	5
12.	4	-1	5
13.	4	2	5
14.	4	2	5
15.	4	2	5
Grand total	49 (65.33%)	28 (37.33%)	75 (100%)
Mean score	3.266	1.866	Per question

POINTER Does a Better than Satisfactory Job

Overall, POINTER scored a total of 49 out of 75 possible points (or 65 percent of the federal level fact-type questions asked of it). The average score was 2.3 points per question. Based on table 1, that means POINTER is doing a good job in the authors' qualitative judgment. Parenthetically, see table 2 for the actual scores on each question. An analysis of efficiency (defined as the number of keystrokes) reveals that POINTER required 120 strokes during the reference interview and 60 for the question negotiation phase (see table 3). A Pearsonian correlation between POINTER's accuracy score and the total number of keystrokes for POINTER's question negotiation was -.237 ($t = .88$, $df = 13$, and $p = .39$). In other words, there is no significant correlation between more extensive question negotiation and higher accuracy in this knowledge-based system.

TABLE 3
KEYSTROKE EFFICIENCY OF POINTER AND GDRA ON THE FIFTEEN TEST QUESTIONS

	POINTER		GDRA	
Question	RI	QN	RI	QN
1.	8	4	8	3
2.	9	5	8	3
3.	6	2	8	3
4.	7	3	8	3
5.	8	4	8	3
6.	8	4	7	2
7.	11	7	8	3
8.	8	4	8	3
9.	8	4	8	3
10.	7	3	8	3
11.	8	4	8	3
12.	8	4	9	4
13.	7	3	8	3
14.	7	3	8	3
15.	10	6	8	3
Grand total	120	60	120	45
Keystrokes				
Mean	8.0	4.0	8.0	3.0
Median	8.0	4.0	8.0	3.0
Standard deviation	1.25	1.25	.37	.37

Note: RI = reference interview; QN = question negotiation

GDRA Is Doing an Almost Satisfactory Job

GDRA scored a total of 28 out of 75 possible points (or 37 percent of the federal level fact-type questions asked of it). The average score was 1.9 points per question. Based on table 1, that means that GDRA is doing a nearly satisfactory job in the authors' qualitative judgment. For a detailed analysis of scoring by question, see table 2. GDRA needed 120 keystrokes in the reference interview but only 45 during its question negotiation. A Pearsonian correlation between GDRA's accuracy score and the total number of keystrokes for GDRA's question negotiation was -.91 ($t = 7.7$, $df = 13$, and $p = .0001$). This time, there is significant correlation between more question negotiation and a lower score.

Comparison of the Two Systems

The second research question asked how these systems compared or contrasted. Neither system does an excellent job (i.e., earning five points in the scoring system), meaning that the user was referred to a single source that provided the complete and correct answer. Overall, though, POINTER is a better system for answering federal-level, fact-type government publication questions.

It may be useful to discuss particular questions where one system did much better or worse than the other. GDRA scored very poorly on question 12 (see Appendix B) because it recommended an inappropriate source and took more keystrokes in the reference interview as well as the question negotiation to achieve the wrong answer. The reason for this situation appears to be that the designers of GDRA did not anticipate users asking retrospective questions, specifically historical ones from the nineteenth century.

Hypotheses Testing

The first hypothesis proposed that there was no difference between the performance of these two knowledge-based systems and the reported literature rate of 52 to 65 percent success in real reference settings. The authors rejected the first part of this hypothesis. POINTER answered 65 percent of the test questions completely and accurately while GDRA answered only 37 percent of them. The second part of the hypothesis related their findings to the reported literature. POINTER matched the higher end of the reference studies while GDRA happened to match McClure and Hernon's 1983 reported findings about the performance of documents librarians.

Arguably, the ideal response for a fact-type question is a single source which contains the complete and correct answer.

Similarly, the authors rejected the second hypothesis that there is no difference in the efficiency between the two systems during the reference interview or question negotiation phase. POINTER required a total of 120 keystrokes (or 60 in the question negotiation phase) before recommending a source(s). On the other hand, GDRA also required 120 total keystrokes to answer the 15 test questions but only 45 in the question negotiation phase. In addition, there is an annoying inconsistency in the use of keystrokes during GDRA's interaction (e.g., sometimes one uses the function key while at other times it is the enter key that is used).

To test their qualitative observation that a modest increase in question negotiation doubles accuracy (i.e., POINTER scores 65 percent accuracy with 60 keystrokes versus GDRA's 37 percent with 45), the authors ran a logistic regression to model accuracy being equal to each knowledge-based system and question negotiation.[23] The chi-square for model fit with 2 degrees of freedom is 13.24, $p = .001$. The association of predicted probabilities and observed responses is concordant 86.6 percent, discordant 8.6 percent, and ties 4.8 percent. The chi-square suggests the model does not fit the data very well while the association of predicted probabilities suggests it

does. However, the power to detect significant differences is low and a larger *N* of test questions would be desirable in the future.

DISCUSSION AND IMPLICATIONS

Much of the preceding section treats the two knowledge-based systems (KBS) systems as a black box—i.e., mere input and output. More attention needs to be focused on the diagnostic issues; for example, why do these systems fail to perform at higher levels? Either system could score higher if it recommended fewer titles at the end of question negotiation. In an extreme case, POINTER recommended nine potentially relevant sources (for question numbers 1 and 15). The authors speculate that the naive user's confidence in the system's knowledge may be lessened by the large number of recommended titles. The authors' scoring system explicitly assumed that users want the single best source which completely and accurately answers their fact-type question.

Obviously, the two systems are still performing at a modest level, that is, they serve as reference systems (i.e., only referrals are given) rather than information systems (i.e., direct answers to the specific questions are given). Ideally, these systems should be able to give the user a direct answer to their question; this situation will most likely occur when these systems have a knowledge base similar to that of humans.

For the moment POINTER has a greater depth of knowledge about the federal level than does GDRA. To be a fully comprehensive system, POINTER ought to have GDRA's greater breadth of coverage. And, of course, in both of the systems under review, there is a substantial burden on the user rather than on the system.

Future Work

Subsequent investigations could take several directions in the future. One possibility is to make a more user-oriented evaluation of the knowledge-based systems. By that the authors mean that the typical user's accuracy as well as satisfaction with the interaction could be measured, either immediately or for the longer term; the authors hypothesize that it would be more in line with what the authors called a conservative approach (see above discussion).

Second, other useful work might involve the identification of the user's model of government information seeking or simply the user's model of the knowledge-based system. Then, one could compare and contrast their model with others such as the one presented by the government information textbook authors.[24]

Third, Cherie Weil's pioneering work at the University of Chicago also raises questions about the relationship of a knowledge-based system and the human reference expert.[25] Using 234 biographical sources, Weil found that while her knowledge-based system answered 10 out of 14 questions (71 percent) correctly and the human expert answered 11 out of 14 (79 percent) correctly, working together the human expert and the knowledge-based system could answer more questions correctly than either one working independently. Could the two KBS systems in this study serve a similar complementary support role for practitioners, especially general reference librarians who only occasionally answer government-publication-type questions?

A narrowly conceived line of future work would be a second pass through the fifteen test questions, taking a more strict or conservative approach, much as a naive user might. A naive user (i.e., one who knows relatively little about government publications or computer systems generally) might be willing to use a computer, but may not understand technical terms related to government information. Hence, the naive user might select, from a long menu, the first item that even looks applicable. In other words, s/he may not be willing to read an entire screen full of information. Such an approach may be said to emulate the unobtrusive approach.

Finally, the scope of analysis could be extended to other levels of government such as state, local, foreign, and interna-

tional/UN. At the present state of development, GDRA would excel POINTER at these other levels of government since POINTER only addresses the federal level.

CONCLUSIONS

This study has demonstrated that there is a need for improvement of knowledge-based systems in the government information field. For the purposes of subsequent research and discussion, the phrase *knowledge-based systems* should be used because it more accurately describes the present state of the art. The question of what role these systems should play needs to be examined in greater detail. Will knowledge-based systems be expected to serve the user in place of the reference librarian, or will they merely be used as supplementary help? The answer will depend on future study. Whatever the case may be, there is certainly a need to improve aspects of these systems, such as the breadth and depth of the knowledge base.

The authors' method of evaluating GDRA and POINTER can be replicated to judge the effectiveness of other knowledge-based systems, either in government information or in general question answering. The authors realize that there is still more research to be done regarding scoring techniques because quality and effectiveness may mean different things to different people. Because this study builds on the definitive studies of reference work, the authors believe their scoring method is a move in the right direction.

The authors believe that these knowledge-based systems have a place in the reference environment, especially in a time of budgetary constraints and staff shortages. In addition, at least one previous study demonstrates that the combination of a reference librarian and a KBS results in more accurate answers than either by themselves. When an overwhelming number of studies reveal that reference accuracy rates fall between 52 percent and 65 percent, automated solutions for the improvement of reference service certainly deserve further exploration.

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7. According to the sixth edition of the *Directory of Government Documents Collections and Librarians* (Bethesda, Md.: CIS, 1991), SUNY reports an extensive collection of federal and state materials and limited collections of local, international, and foreign documents.
8. Bruce L. Harley and Patricia J. Knobloch, "Government Documents Reference Aid: An Expert Systems Development Project," *Government Publications Review* 19 (Jan./Feb. 1991): 15–33.
9. According to the sixth edition of the *Directory of Government Documents Collections and Librarians* (Bethesda, Md.: CIS, 1991), Stanford holds an extensive collection of federal, international, and foreign documents and a moderate collection of state and local materials.

10. John Richardson, *Knowledge-based Systems for General Reference Work* (San Diego: Academic, 1995).
11. Ibid.
12. The first author consulted with Peter Hernon who has worked extensively in this area as well. He agreed that "there has never been a reported study done on the types of questions asked. There have been studies—with no reliability and validity indicators—of the questions asked at a general reference desk," correspondence dated Apr. 30, 1993.
13. Kenny Crews, "The Accuracy of Reference Services: Variables for Research and Implementation," *Library and Information Science Research* 10 (July/Sept. 1988): 331–56.
14. Charles A. Bunge, *Professional Education and Reference Efficiency*, Research Series No. 11 (Springfield, Ill.: Illinois State Library, 1968; abridged version of "Professional Education and Reference Efficiency" (Ph.D. diss., University of Illinois, 1967); Terence Crowley and Thomas Childers, *Information Service in Public Libraries: Two Studies* (Metuchen, N.J.: Scarecrow, 1971); Jassim M. Jirjees, "Telephone Reference/Information Services in Selected Northeastern College Libraries," in *The Accuracy of Telephone Reference/Information Services in Academic Libraries: Two Studies* (Metuchen, N.J.: Scarecrow, 1983); Peter Hernon and Charles R. McClure, *Improving the Quality of Reference Service for Government Publications*, ALA Studies in Librarianship, No. 10 (Chicago: ALA, 1983) and *Unobtrusive Testing and Library Reference Services* (Norwood, N.J.: Ablex, 1987); Marcia J. Myers, "Telephone Reference/Information Services in Selected Northeastern College Libraries," in *The Accuracy of Telephone Reference/Information Services in Academic Libraries: Two Studies* (Metuchen, N.J.: Scarecrow, 1983); and Kathy A. Way, "Quality Reference Service in Law School Depository Libraries: A Cause for Action," *Government Publications Review* 14 (1987): 207–19.
15. In the history of reference quality, most studies have asked as few as ten questions while only a few have asked as many as twenty. Future work should consider the implication of small *Ns*; generally as *N* increases, so does sensitivity.
16. Because almost any question could be answered using a government publication, we tried to select only those obviously requiring such a source: i.e., questions requiring an official version, an authoritative source, or reliable statistical information. From Bunge's Appendix C, which lists eight government documents questions (i.e., 1, 2, 4, 7, 18, 20, 23, and 28), we randomly selected numbers 8 and 9; Childers had eight (i.e., 2, 5, 9, 11, 18, 22, 25, and 26), we selected number 4 and 5; Crowley had four (i.e., 1, 2–4, 7, and 8), we selected number 2; Jirjees' nine (i.e., 1, 6, 7, 12, 16, 17, 24, 28, and 34), we selected number 8 and 9; Way's twelve (i.e., 1, 3, 4, 5, 6, 8, 11, 12, 17, 18, 19, and 20), we took number 3 and 6; Myers' four (i.e., 1, 5, 7, and 13), number 7; McClure and Hernon's (1983, appendix A) listed twenty (i.e., all of them), we selected number 3, 9 and 17; and from McClure and Hernon (1987, appendix B), fifteen (i.e., all of them), we selected number 1 and 12.
17. We need more studies on the degree of difficulty issue. In 1967 Bunge asked 47 librarians, of whom 37 responded, to rate questions as "easier, average, or harder" than normal (see *Professional Education*, appendix B).
18. Crews, "The Accuracy of Reference Services," 331–56.
19. The issue of multiple sources is vexing. A user validation of the response scheme is highly desirable. For instance, we need to know the answer to the following questions: (1) Is the user more confident when he has more sources in hand, or (2) Is the user more satisfied when he has more sources in hand?
20. Cheryl Elzy, Alan Nourie, F. W. Lancaster, and Kurt M. Joseph, "Evaluating Reference Service in a Large Academic Library," *College and Research Libraries* 52 (Sept. 1991): 454–65.
21. Ibid., p. 458. One consequence of negative values is that if the data screening reveals that the distribution of this variable is not normal, then a constant may be added before undertaking logarithmic transformations. A. A. Afifi and Virginia Clark provide a clear discussion of this point as well as the "effect on the statistical properties of the transformed variable" in their *Computer-Aided Multivariate Analysis*, 2d ed. (New York: Van Nostrand Reinhold, 1990), 53.
22. The standard discussion of such statistical matters is covered in Vic Barnett and Toby Lewis, *Outliers in Statistical Data*, 2d ed. (New York: Wiley, 1984) or R. D. Cook, "Influential Observations in Linear Regression," *Journal of the American Statistical Association* 74 (1979): 169–74.

23. When the dependent variable is dichotomous (i.e., high accuracy versus low accuracy), a logistic regression is appropriate; see David W. Hosmer Jr. and Stanley Lemeshow, *Applied Logistic Regression* (New York: John Wiley and Sons, Inc., 1989). For our analysis, SCR=MACHINE QN where AVGSCR=actual score/potential score and if AVGSCR .5 then SCR =1 and ELSE = 0. Machine is dummy coded 1 for POINTER and 0 for GDRA.
24. John Richardson Jr., "Paradigmatic Shifts in the Teaching of Government Publications, 1895–1985," *Journal of Education for Library and Information Science* 26 (Spring 1986): 249–66; reprint ed., *Encyclopedia of Library and Information Science*, vol. 44: 242–58.
25. Cherie B. Weil, "Classification and Automatic Retrieval of Biographical Reference Books" (master's thesis, University of Chicago, 1967; idem, "Automatic Retrieval of Biographical Reference Books," *Journal of Library Automation* 1 (Dec. 1968): 239–49. In fact, Weil said that she could not answer three of the four questions because she had exhausted her resources; her knowledge-based system found answers to those three questions in the same sources to which Weil had access.

APPENDIX A
Set of Three Training Questions

1. For a term paper in history, I am studying the Army's use of camels in the nineteenth century. It is my understanding that there is a government document, from the 1850s, on the topic. Please help me find it. (Hernon and McClure, 1983, #1)
2. I would like to know the name of a general who was forced to retire from the Army after twice publicly criticizing President Carter's military policies. I think the incident took place sometime around the middle of 1977. (Jirjees, #3)
3. When was George Washington given the title of General of the Armies of the United States? (Myers, #2)

APPENDIX B
Fifteen Test Questions

1. I would like the names and office addresses of the senators and representatives representing me in the federal legislature. I live in the downtown area of this city. (Bunge, #1)
   POINTER: Y, N, N, 3, 3 = *Government Manual, Official Congressional Directory,* FED, *Congressional Staff Directory,* and Government Documents Catalog.
   GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index.*

*2. How much more or less expensive is it for an average family to live in Chicago than it is in Atlanta? (Bunge, #18)
   POINTER: Y, N, N, 3, 2, N, 2 = *American Statistics Index* and *Statistical Abstract.*
   GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index.*

*3. Where is the nearest commercial airport to Rio Grande, Ohio? (Childers, #11)
   POINTER: Y, N, N, 4 = Maps (referral to same institution, but different department) plus *Using Government Publications* and *Monthly Catalog* and Government Documents Catalog.
   GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index.*

4. What is the salary of the President of the United States? (Childers, # 22; assumptions: federal law)
   POINTER: Y, N, N, 3, 5 = *United States Code.*
   GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index.*

5. What is the name of the secretary of commerce? (Crowley, #2-4)
   POINTER: Y, N, N, 3, 3 = *United States Government Manual.*
   GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index.*

6. I need to know the percentage of persons below the poverty line in Colorado for the year 1975. (Jirjees, # 28)
   POINTER: Y, N, N, 3, 2, Y = 1980 Census.
   GDRA: INTRO, F2, F2, STATS, US STATS, F2 = *American Statistics Index.*

*7. In 1977 the U.S. Commission on Civil Rights released a report called *Window Dressing on the Set*. It's about the treatment of women and minorities on TV. Has the commission published any study to update that report since then? (Jirjees, #34; assumptions: subject approach; report, when do you stop—after checking every year since 1977)
POINTER: Y, N, N, 3, 14, 7, Y, and 8 = *Monthly Catalog* and Cumulative Index 1981–85, 1976–1980.
GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index*.

*8. I understand that the Caffeine Study Review Panel submitted its final report to the Food and Drug Administration on May 15, 1981. The report contains information pertinent to the FDA's review of the safety of added caffeine. I would like to know if the final report is available. (McClure and Hernon, 1983, # 3; the authors deleted the remainder of this question.)
POINTER: Y, N, N, 3, 14, 7 = *Monthly Catalog* and *Cumulative Index*.
GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index*.

9. In February 1978, there was an FTC (Federal Trade Commission) staff report on television advertising to children, by Ellis M. Ratner and others. It recommended the elimination of "harms arising out of television advertising to children." Is it still in print? What is the cost? (McClure and Hernon, 1983, #9; assumptions: current date)
POINTER: Y, N, N, 3, 14, 8 = Government Documents Catalog; *Publication Reference File*.
GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index*.

10. Where can I get a detailed breakdown of the distribution of federal funds for research and development by agency? (McClure and Hernon, 1983, #17)
POINTER: Y, N, N, 3, 4 = *Catalog of Federal Domestic Assistance*.
GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index*.

11. What is the zip code for Behrend College in Erie, Pennsylvania? (Myers, #7; assumptions: inquirer does not want address and the college is not a government organization)
POINTER: Y, N, N, 3, 14, 8 = Government Documents Catalog; Publications Reference File; Cumulative Index; *Monthly Catalog*.
GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index*.

12. For a term paper in history, I am studying the laws on the imprisonment of free black seamen in the South prior to the Civil War. It is my understanding that the government published a report on the topic in the 1840s. (McClure and Hernon, 1987, #1; assumptions: laws = Congress)
POINTER: Y, N, N, 3, 14, 1 = *CIS Index* or *CIS US Serial Set Index*.
GDRA: INTRO, F2, F2, INFO, US, F2, F, CONG = *CIS Index*.

13. In 1980 a public law was enacted that it provided universities and small business with the right to obtain patents for inventions which their faculties and staff created with the use of Federal funds. Please help me locate a copy of the law. (McClure and Hernon, 1987, #12)
POINTER: Y, N, N, 3, 5 = *U.S. Code* and other titles.
GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index*.

14. How many years must a U.S. magistrate have been a member of the bar prior to appointment? (Way, #4; assumptions: federal law)
POINTER: Y, N, N, 3, 5 = United States Code or 6 = *Code of Federal Regulations*.
GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index*.

15. Did former President Ford appoint Barbara Walters and Katherine Hepburn to the National Commission on the Observance of International Women's Year? (Way, #17; assumptions: done by Executive Order)
POINTER: Y, N, N, 3, 8 = *Weekly Compilation of Presidential Documents or Public Papers of the Presidents*.
GDRA: INTRO, F2, F2, INFO, US, F2, T = *Monthly Catalog* or *CIS Index*.

Note: For POINTER, N = No, Y = Yes, numbers are responses required at menu options. For GDRA, INTRO = Introduction, F2 Continue, Info = Information, US = United States, STAT = Statistics, and T = True.

* Indicates initial disagreement in interpreting appropriate response to system's question. Consensus, as reported in appendix, was achieved after discussion.

Information Access Instruction (IAI[4]): Design Principles

Zorana Ercegovac

This article proposes four design principles—The User, Active Learning, Conceptual Model of Teaching, and Modularity—as a conceptual framework of an Information Access Instruction (IAI[4]). These principles, when put in practice as specific guidelines, seamlessly link information sources together, regardless of their implementation medium, information structure, or interface style. Examples are drawn from a section of a four-unit elective undergraduate course taught in the Department of Library and Information Science, University of California at Los Angeles.

Learning to use and teach increasingly complex information sources and systems presents numerous challenges both to learners and educators. When the learner is a college student in a large research academic setting, it is crucial to teach the student how to access local and distributed information sources regardless of their format and structure.

UCLA's Department of Library and Information Science (LIS) has developed an elective four-unit undergraduate course, *Information Sources and Libraries*, LIS 110. The forty-hour course is offered during each of three academic quarters with two sections per quarter. Two forty-five-minute classes meet two times a week for ten weeks. The course is currently being taught by three instructors with about thirty-five students per section. There is no prerequisite for enrolling in the course other than general college requirements. This means that students bring to the class different academic and cultural backgrounds, different experiences and attitudes toward libraries, and different levels of technical competence in the use of information technologies.

Since its inception in 1970s, the LIS 110 material (e.g., syllabi, assignments, lecture notes) has been shaped by varied instructional viewpoints, experiences, technologies and administrative contexts. During the early era the course emphasized the use of printed bibliographic sources, card catalogs, and corresponding filing techniques. At that time online searching of multidatabase retrieval systems was reserved for graduate library students who would be doing online searching, typically on Texas Instrument terminals at 300 bauds. During the middle era the material was still organized around printed bibliographic sources, but instruction shifted away from card catalogs and filing techniques toward searching online public access catalogs, OPACs. Most recently, I have covered both electronic (e.g., OPACs, databases on CD-ROMs, information accessible through Internet/gophers) and printed sources regardless of their format (e.g.,

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reference books, audiovisual sources, manuscripts, government documents).

Is there a way that librarians can integrate information sources regardless of their medium (e.g., printed, electronic, distributed, and multimedia) into a single information access instruction program? Is there a metaphor that can aid us in teaching information structures regardless of the implementation medium (e.g., Wilson's printed *Art Index* and its online and CD-ROM products)? How conceptually different are, for example, printed Wilson's indexes from their electronic versions with regard to general makeup and structure of their files and records, display features, ease of use, time necessary to locate a relevant citation, or learning curve? We need a conceptual framework that would be user-sensitive, information-rich, and sufficiently flexible in order to assist designers of bibliographic instruction (BI) programs to integrate sources regardless of their implementation medium and information structure. Such a framework would provide both uniformity with regard to teaching style and flexibility to include/exclude emerging or obsolete information technologies and sources as appropriate. The proposed framework, based on four design principles, supports these requirements. It also applies to varying lengths of instructional units. In order to educate a population of self-sustained researchers, we need to consider the entire information space rather than arbitrary sources that happen to be conveniently accessible at a given time and place. After a brief review of BI literature, I will describe four design principles that are applied in my section of LIS 110, and report some of the preliminary results.

PRIOR WORK

The reviewed literature for this paper suggests two main forms of training end-users: (1) software search aid programs, and (2) bibliographic instruction programs.

Software Search Aid Programs

Known as front-ends, gateways, intermediary systems, and computer-assisted instruction (CAI), *software search aid programs* are designed to assist the online searcher in many different ways. Some offer simplified, and often compromised, views of native systems or virtual interfaces to several related systems; others, to a limited extent, provide special features in response to characteristics of a certain professional user group (e.g., Biosis B-I-T-S, BRS Colleague, GratefulMed, MicroDisclosure). The literature focuses on OPACs, remote online databases, and CAI programs.[1]

As electronic sources grow, it becomes difficult even for the trained intermediaries to maintain their searching skills. Thus, while we can argue that front-end interfaces can be useful to anyone who searches today's numerous databases, we might question their training usefulness especially for end-users, if the front-ends oversimplify native features, inhibit overall process of learning, or hide other potentially useful sources.

Bibliographic Instruction Programs

The reviewed literature reveals a multiplicity of viewpoints with regard to teaching model and structure, confusion as to how we should name BI, and disagreement over the information instruction/consultation versus information delivery debate. Case studies are prevalent. The studies are typically in the pattern BI + X, where X ranges from collection development, interlibrary loan, electronic sources, critical thinking, or a specific population of end-users such as sophomore-level biology majors or the health care community.[2-7] As expected, BI seems to be largely unregulated in terms of library policy and professional training.[8] The reviewed literature is somewhat lacking in the areas of applied BI models and performance evaluation studies. There are exceptions.

The Model Statement of Objectives for Academic Bibliographic Instruction reflects the current trend in library education away from tool-based instruction and toward concept-based instruction; it recognizes the importance of studying user groups to be served and concerns itself with the ways information is defined,

structured, organized, and accessed.[9] The model has been applied at several major academic libraries.

Nancy O'Hanlon describes a "flexible BI model" for developing library research skills based on an analysis of a relevant text, for instance, a term paper.[10] The model builds on the assumption that, to use the library resources effectively, an instructional designer needs to account for *affective*, *cognitive*, and *psychomotor* components of human behavior. O'Hanlon's paper describes ways these three components are integrated in her BI course and suggests various possibilities to incorporate these into computer-assisted instruction-based modules.

Ruth Curtis and Herbert Carson isolate and analyze motivational strategies developed in the ARCS model of motivational design (Attention, Relevance, Confidence, Satisfaction). Unfortunately, no empirical data support the proposed model and evaluate its intuitively sound recipe.[11] While most of the evaluative studies are quantitative, Elizabeth Frick suggests that qualitative approaches may be more appropriate for library user education programs under certain circumstances than quantitative approaches.[12]

DESIGN PRINCIPLES AND THEIR IMPLEMENTATION: A CASE STUDY

This section introduces four design principles of Information Access Instruction (IAI[4]) and describes how these are implemented in my section of LIS 110. These principles are: (1) *The User*; (2) *Active Learning*; (3) *Conceptual Model of Teaching*; and (4) *Modularity*. Design principles are based on the literature in individual differences research, applied cognitive psychology, information seeking, and information retrieval, as well as my own teaching experience.

Design Principle #1: Know The User

If we agree that the main goal of BI is to produce users who can view information as a unique resource and effectively access, evaluate, manage, and communicate information regardless of its structure and medium, then we need first to understand characteristics of the increasingly heterogeneous group of students we intend to educate in these nontrivial tasks.

Background. There is an uneven distribution of research on how different types of searchers (e.g., library-trained intermediaries, information brokers with varied backgrounds, and end-users, including domain specialists, college students, and the general public) use different types of information technologies (e.g., printed, online remote databases, OPACs, Internet sources). For example, we know relatively more about the information-seeking behavior and success/failure rates of college students as searchers of OPACs than we do about how they fare as searchers of unabridged online databases on commercial retrieval systems and native interfaces, or how well they navigate through large Internet spaces. Success rates of professional end-users who search health or legal databases and Internet sources have just begun to emerge.[13–16]

Investigators sought to identify potential predictors on search process and information retrieval performance. The studied variables thought to contribute to performance differences have included academic major, Graduate Record Exam (GRE) quantitative scores, database experience, frequency of use, age, and gender, among other factors.[17–23] A nationwide study of online library catalogs found that people had serious conceptual difficulties, especially with the selection of terms and search modification.[24] These findings, and my own experience, have suggested that, in order to design a BI course that would be user-sensitive, we need to begin with the user.

Implementation in 110. Two types of questionnaires are administered in the beginning of each term in addition to an informal introduction of students to the class.

The students' background characteristics questionnaire (Q1) is designed to gather data on academic major, status (e.g., freshmen, sophomores, juniors, seniors), level of perceived technical competency (e.g., use of computers, frequency of using library catalogs), students' aspira-

tions (e.g., intention to enter graduate and professional schools), past experiences with BI programs, general attitude toward the library, and past and anticipated frequency of writing term papers.

The students' level of information literacy or knowledge content questionnaire (Q2) is organized around three main groups of questions: the extent to which students are aware of tools such as Library of Congress Subject Headings (LCSH) and Library of Congress Classification System (e.g., main purposes and uses in printed indexes and electronic reference sources); students' ability to interpret data elements in bibliographies, indexes, and library catalogs (e.g., to interpret subject headings in different bibliographic settings, holding information about serials, and data elements for different library formats); and students' ability to apply basic search strategy techniques when using OPACs and other reference sources.

Part of students' future scholarly competence is their ability to seek employment opportunities through formal and informal channels, to locate funding sources for potential research activities, and, in general, to have lifelong survival information skills.

Students are told that the questionnaires serve three purposes: to make them comfortable with basic library vocabulary and concepts, to provide a model for subsequent tests, and to customize the content of the course, as much as it is possible, to students' academic orientation and their level of competency.

The answers to the questions pertaining to students' background characteristics (Q1) were examined so that students' capabilities could be incorporated into the design of the course. The answers to the questions in the knowledge content pretest (Q2) were reviewed in the class and returned to students.

Data on students' age, gender, ethnicity, and SAT scores are not gathered. Most students are between eighteen and twenty-two, about equally distributed by gender, increasingly culturally diverse, and have all satisfied general admission college standard tests (e.g., SAT, the Test of English as a Foreign Language [TOEFL]). These data have important implications in designing the content, pace, and structure of the BI course.

Design Principle #2: Apply Active Learning

Active learning, also known as participatory or collaboratory learning, is extensively discussed in the areas of cognitive and education psychology.

Background. In contrast to the stimulus-response paradigm which was adhered to in the early days of cognitive psychology and which emphasizes passive learning and memorization, active learning of real and complex tasks, such as learning to search databases or to use word processors, is driven by the initiatives of the learners, their background knowledge, skills, and experience.[25–30]

Some of the findings from studies on active learning and information seeking influenced a number of guidelines incorporated into the course (e.g., what the goals are; what the precisely measurable achievement outcomes are; what solving-based take-home or in-class assignments are used, and what class discussion covers).

Implementation in 110. Special attention is given to shaping term project topics that students select and subsequently report their search process and research findings to the class. Since students select their own topics, motivational and relevance components are used to guide them throughout the process of preparing a term project, a bibliographic essay. Students receive a three-page handout of specific instructions to aid them in the preparation of the term project. Samples of topics are listed along with examples showing annotated entries for reference sources and topical works.

In addition, a series of eight take-home hands-on assignments are designed to aid the student progressively in the use of basic research tools (e.g.,

concepts of citation and its role in scholarly communication cycle, controlled vocabulary such as LCSH and Medical Subject Headings (MeSH), factual sources (e.g., Internet-based cluster of sources, printed and electronic dictionaries and encyclopedias), and bibliographic sources, including library catalogs and indexing and abstracting services on different media. Students obtain feedback on these assignments from the instructor and may, with appropriate modifications, incorporate them into their term projects.

Part of students' future scholarly competence is their ability to seek employment opportunities through formal and informal channels, to locate funding sources for potential research activities, and, in general, to have lifelong survival information skills (e.g., to know where to look up for health, legal, educational, community-related, business and financial programs, organizations, and experts). Students earn 10 percent of their final grade based on active participation, which involves small-group class projects, discussion in the class based on assigned readings, and presentation of the term project findings to the class.

Design Principle #3: Use Conceptual Model of Teaching

Background. Christine Borgman trained college students on a fifty-record prototype online catalog using two teaching methods: a conceptual method which induces a mental model of the target system, and a procedural method which uses a step-by-step approach typically used to train students to search online databases.[31] The study found that those trained by the conceptual method performed better on complex tasks while the two groups performed equally well on simple tasks. Since most of the required searching tasks in the 110 course are complex, the conceptual method has been adopted whenever possible.

Implementation in 110. The concept of data structure is introduced and illustrated with examples from printed and electronic sources, regardless of their structure or format (e.g., parallel structure of files, records, and data elements in bibliographic Wilson Indexes—both printed and electronic; directories such as the yellow pages and other phone books; and geospatial sources such as *Geographic Information Systems*, GISs). As a result, the concept of a record is defined and shown in many different contexts and display arrangements.

Students learn important concepts of retrieval systems in a simple in-class exercise. They read a two-page journal article and then assign both key words and concept words representing the subject matter of the article. Students also create other data elements for author(s), title, source, and any other descriptive information they would find useful for the purposes of organization and retrieval. The exercise reveals principal library functions of collecting, organizing, and retrieving library documents, and increases the students' level of appreciation for intellectual library activities. It also explains a number of important puzzles: why many government documents may not be searchable by subject words, why we need to search by title words as well as by subject headings, if available, and why the same article may often be represented in a variety of ways in different types of catalogs (e.g., library and trade), indexing and abstracting sources (e.g., with different levels of detail), and bibliographies.

Similarly, the notion of information qualities is introduced early on in the course and applied to narrow down a term paper topic, to modify a student's search on OPACs, or to ask a specific reference question. By limiting the topic of alcohol drinking by any or all of parameters (e.g., time, place, perspective, agent, language, document type, country of publication), the term paper topic is focused to its working title, "Impact of Alcohol Drinking Legislation on Traffic Accidents among Youth in California in the Recent Literature."

Students learn to plan their searching before they "go online." Specifically, they learn where to start, and how to determine first best sources based on types of information they need; students

also learn various search approaches such as known-item search, subject search, specific versus comprehensive search, and factual versus bibliographic search. Since searching, displaying, and printing features are not yet standardized across different databases even on a single system, students learn to use help features and to draw their own comparative charts of database features. In addition, some of the universal system features, such as Boolean and proximity operators, truncation, and ranking capability, are explained in the context of broadening or narrowing one's search (e.g., ORION, MELVYL, VERONICA, WAIS).

Design Principle #4: Use Modularity

Background. The design principle of modularity attempts to deal with an issue of chunking. The concept of chunking has been studied extensively in the areas of cognitive and educational psychology. Herbert A. Simon's article, "How Big Is a Chunk?" examines earlier studies on human memory, extracts estimates of parameters that appear to be crucial to performance in complex tasks, and illustrates how these parameter values predict behavior in a range of laboratory situations.[32] Accordingly, a chunk of any kind of stimulus, including geometrical designs, concrete words, or sentences, is the quantity of five items that short-term memory will hold. The findings from this study and others have consistently indicated that chunking is an efficient learning strategy in helping reduce completion time of performance measures, and that text material presented in chunks significantly improves reading comprehension of good as well as poor readers.[33-34] The chunking idea has been well-studied and confirmed in laboratory experiments and field situations.

Implementation in 110. Chunking concerns itself with some of the related questions just mentioned: what and how much material should we include in a forty-five–minute chunk of time at different levels of BI (e.g., not-for-credit course, abridged two-unit course, four-unit breadth requirement course). Sequencing and linking units together deserve our attention as well. What are the most important concepts or tools we want to convey, so that our students can be self-reliant, confident, and motivated users of information sources and services? How do we rank order the importance of information concepts and sources? How do we deal with issues such as learners' attention span, information overload, feature shock syndrome, and other competing campuswide activities, programs, and attractions.

At the level of interfaces, we need to find a common thread in teaching command-driven, menu-based, direct manipulation, and navigational interfaces without creating an information overload in a given chunk of time.

The related principle of scalability concerns itself with issues of extension and transportability across varied formats and different platforms. With regard to extension, if a ten-hour BI course is to be scaled up to a twenty-hour course, what should we add? Similarly, where should we cut if we have to scale down a course to a four- or five-hour BI unit? Is there a common denominator among varying lengths of instructional units?

In the context of BI instruction, we need to consider problems of compatibility at multiple levels. At the level of interfaces, we need to find a common thread in teaching command-driven, menu-based, direct manipulation, and navigational interfaces without creating an information overload in a given chunk of time. At another level, we need to consider a variety of database protocols, including indexing policies, tools, and special features to go with each database. At the level of teaching information sources, we need to integrate sources coherently and dynamically with local, regional, and virtual significance. By that I mean we must treat both "local significance" sources

(e.g., UCLA libraries, labs, campus backbone network, human networks of free consultants and experts, computing facilities) and virtual digital libraries on the same plane.

Conclusions and Preliminary Findings

I believe that the design principles just presented are sufficiently flexible to be replicable in similar settings, including classroom instruction or informal BI multimodular unit programs. The principles could be also applied to different instructional media, including network-based or computer-assisted instruction. Additional details of my work on which this paper is based can be found in the technical report by Zorana Ercegovac.[35]

Who Are the Students? While 80 percent of my students have remained in the social sciences and humanities, more recently I have seen a shift from predominantly upper-division to lower-division college status. Perhaps students are starting to notice the applicability of the course content to their professional careers and take the course early on "so that they can apply to other courses" rather than just to "fill-in breadth requirements." Most of the students wish to pursue graduate studies and anticipate doing more researching and writing in future. Students' self-reported and perceived level of competence obtained from Q1 is higher than their actual competence as measured by the pretest knowledge content scores from Q2. Students are predominantly self-trained, with little or no library experience from former schools.

How Do Students Fare? Preliminary findings are obtained on the impact of the Information Access Instruction, IAI[4], as measured by three different instruments: a campuswide questionnaire on evaluation of the instruction program that is administered at the end of each quarter, two written tests on knowledge content, and the quality of the term paper, a bibliographic essay. A one-group pretest-posttest design (n = 216) has been used in this preliminary study to provide insights for more controlled studies in the future.

The campuswide questionnaire gathers data on students' views with regard to their subject interest before the course versus after the course; perceptions of the importance of the course relative to other courses they have taken; and written comments on the course.

Two knowledge content posttests that are worth 20 and 30 percent of the final grade are organized around five groups of questions: use of controlled vocabularies and classification schemes in searching and browsing; characteristics of reference sources and literatures from different disciplines for factual and bibliographic information; specific features of online library systems (e.g., OPACs, CD-ROMs); interpretation and specific features of certain indexing and abstracting sources; understanding the nature of information needs and locating the most suitable reference source(s) to meet one's needs.

The term paper, which is worth 40 percent of the final grade, attempts to measure students' cumulative applied mastery of literatures pertinent to the topic of the paper, online searching skills, and general reference sources for factual and bibliographic information. Equally important are the students' attention to accuracy, organization, insight, and good writing style. Finally, students' active participation in in-class assignments and discussions is worth 10 percent of their final grade.

CONCLUSIONS

As the importance of bibliographic instruction becomes more critical, more systematic research is needed to investigate many open questions: the extent to which BI should be presented in different settings, type of format and instructional techniques, standards and evaluation criteria (e.g., prerequisites of students if any, training of BI instructors), to mention just few examples that await attention. We have the opportunity and responsibility to design information access programs that will coherently integrate presentation of varied information tools and sources in an active and rich learning experience.

An annotated presentation program, IAI[4], based on the four design principles, is developed in Microsoft's PowerPoint graphical presentation package. IAI[4] consists of two parts as follows: part 1 is the instructor's presentation program. Each of the ten modules has about thirty color screens and corresponds to two forty-five–minute instructional units. Each screen contains annotations describing the screen, a list of readings, and questions for class discussion. Part 2 is the student's Notebook. It contains copies of screens from the IAI[4] modules with a listing of reference sources and in-class exercises. The program will be tested during the fall term 1994 and the performance results will be reported in the literature.

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The Opportunity Costs of Faculty Status for Academic Librarians

Bruce R. Kingma and Gillian M. McCombs

Faculty status for academic librarians is a topic which has consumed the attention of the profession for the last forty years. Very little of the discussion has focused on the costs this status imposes on the institution. This article attempts to point out and document the economic costs of this model, while at the same time encouraging campus and library managers generally to employ economic principles as a methodology by which to analyze their institutions.

According to economists, an opportunity cost of a product or service is "the value of what must be given up in order to acquire the item or perform the service."[1] These costs are called "opportunity" costs because they represent the opportunities the individual or agency must forgo to achieve the desired output although they include the actual dollar outlay. For example, the opportunity cost of the library purchasing a book includes not only the purchase price but also the staff time spent processing, reshelving, and repairing the book over its shelf life.

Faculty status for academic librarians is a topic which has consumed the attention of the profession for the last forty years.[2] More has been written about this subject than about any other related topic in academic librarianship.[3] However, very little attention has been paid to the opportunity costs of faculty status as a component of the total cost of library services. No one has attempted to attach a dollar value to these opportunity costs in the way an economist would.[4] This article will show that there is a certain amount of value to be gained from this kind of analysis. Certainly it is important to understand that, whatever the benefits, faculty status is not cost-neutral.

An economic modeling of faculty status cannot proceed without a definition of terms. Over the years, faculty status for librarians has meant different things at different institutions. For purposes of simplicity and consistency, the authors have interpreted faculty status as defined in the 1992 Association of College and Research Libraries (ACRL) "Standards for Faculty Status for College and University Librarians."[5] In order to provide consistent data sets, the study population has been confined to one subset of academic libraries—those that are members of the Association of Research Libraries (ARL).[6]

The institution of faculty status imposes real and opportunity costs on an academic library. The real costs of faculty status include travel expenses for attending conferences, resources for

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writing papers and sending surveys, and other research costs. Some portion of these costs are also incurred at institutions without faculty status. The opportunity costs of faculty status include the value of the time that librarians use to pursue research interests in addition to the financial costs. The time costs include sabbaticals and other forms of release time, such as the hours allowed the librarian each week to write scholarly articles or give presentations outside the library. As with teaching faculty, additional persons must be hired to do the work of the librarian pursuing tenure or promotion. Alternatively the tasks are absorbed by other staff members. If the librarian's task/function is not performed, the consequence for the patrons is a loss of service. This could include delays in implementing new services, the accumulation of cataloging backlogs, or the loss of collection development expertise and hours at the reference desk. There are also across-the-board overhead costs. The peer review process, used to monitor the production of research and perform quality control functions, involves time spent by all librarians to review files and meet collectively.

For example, figure 1 shows the hours of work of four catalogers at a typical academic library with faculty status. Catalogers A, B, and C work full-time cataloging books. However, part of their 35-hour week includes time spent in professional development. At the same time, cataloger D is on sabbatical. The net cost of the professional development time by these four librarians is 51 (5+9+2+35) hours. If replacement catalogers are paid $15 per hour (or $525 per week), then faculty status results in a real cost to the library of $765 per week. While each of these catalogers may spend additional hours engaged in research beyond the 35-hour week (research on teaching faculty shows that faculty spend 50+ hours a week at their jobs), the time spent during the 35-hour workweek has a real cost to the library.

Another way to look at this is in terms of potential "overstaffing" costs. If a library has set certain performance goals,

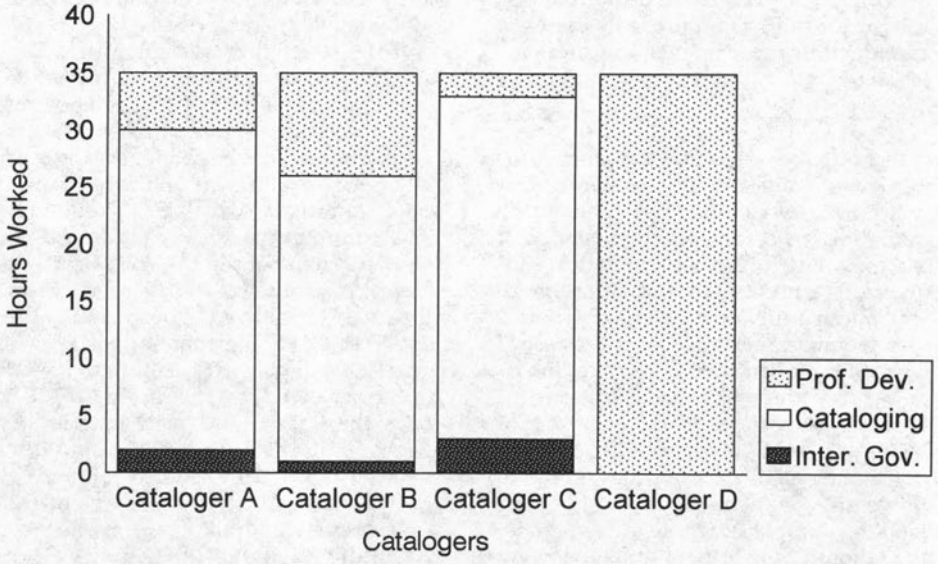

FIGURE 1
Cataloger Hours

such as no book or order sits in any Technical Services Department longer than two days, staffing levels must accommodate both these goals and the need for professional development activities. Using the previous example, the library will then be paying for an additional 51 hours a week, representing an added cost to library services. From a public services point of view, if a reference desk must be staffed by a minimum of two librarians for 90 hours a week, and the available pool of librarian hours is reduced because of the need to spend time working to sustain faculty status, the pool of available hours will have to be increased across-the-board. A recent study on reference desk staffing adequacy also raised the concern that the quality of reference service is suffering because of inadequate staffing.[7] In either case, the time spent on research by librarians will cost the library additional resources.

When 51 hours of catalogers' or reference librarians' time are spent writing rather than cataloging or serving on the reference desk, it takes longer for books and journals to be cataloged or for reference inquiries to be answered.

It should be noted that these opportunity costs are not unique to library faculty. Faculty status has the same potential costs for teaching faculty. If teaching faculty are on sabbatical, adjunct or visiting faculty must be hired. The opportunity cost of a teaching faculty member on sabbatical is the cost of employing an adjunct to replace him or her. Just as the cost of faculty status for library faculty should include the cost of hiring replacements, so should the cost of teaching faculty. In fact, in response to university financial pressures teaching faculty are increasingly being judged by the amount of external grants they generate for the university. Teaching faculty "buy-outs" of classes and sabbaticals frequently come as the result of generating external grants to pay for an adjunct. The resulting cost to the university of hiring adjuncts or additional staff for teaching faculty or librarians is the cost of these additional employees minus the amount of external funds generated.

However, the dollar amount necessary to replace hours lost to professional development, $765 or 51 hours in our previous example, is a conservative estimate of the full cost of faculty status for university librarians. If replacement catalogers are not hired, the opportunity cost of faculty status is larger than this. It is the value of the productivity lost as a result of librarians spending these hours in professional development. When 51 hours of catalogers' or reference librarians' time are spent writing rather than cataloging or serving on the reference desk, it takes longer for books and journals to be cataloged or for reference inquiries to be answered. This time delay denies faculty and students access to information. The opportunity cost of faculty status equals the lost benefits of access to this information during the time delay (see Richard Meyer's article "Earnings Gains through the Institutionalized Standard of Faculty Status" for a more detailed data analysis).[8]

To illustrate this concept further, assume that a librarian catalogs an average of four books an hour. Then 51 hours of cataloger's time equate to 204 books a week that will not be cataloged until the following week. Each book that is not cataloged is not available to the university community for use during that week. Each use of a book by a patron has a benefit to that patron. The benefit of the use of a book is the perceived value of access by the patron. To receive this benefit, each patron is willing to spend his or her own time to acquire the book from the library and read it. The expected value or expected benefit of the book to the patron can be assumed to be at least as much as the value of the time spent in acquiring and reading it. Assuming that patron benefits from the use of books can be quantified and ranked from highest to lowest, the lost opportunities or benefits from the use of

books that are not accessible to the patrons as a result of a one-week delay can be measured.

Figure 2 shows the total benefit of new books to the university community per week. Each book made available each week provides a benefit to a library patron. Since there are no quantitative studies of the value of a book in the library to a patron, the values in figure 2 are assumed in order to illustrate the opportunity cost. In figure 2, the initial 200 books cataloged in a week provide a benefit, by assumption, of $2,000 or, on average, $10 per book. The 200th through 400th books provide an additional benefit of $1,800, or $9 per book, for a total benefit of $3,800.

In the faculty status model, the cataloging of 204 books is delayed by one week. If 1,204 books could be cataloged in a given week but only 1,000 books are cataloged, then, according to figure 2, the university community would lose $1,000 in potential benefits. Thus, the opportunity cost of faculty status is the benefit lost to the university community of $1,000 rather than simply the replacement cost or real cost of $765 for the four catalogers.

The institution of faculty status is assumed to benefit the university community in the form of a more productive library that employs higher-quality librarians and enhances the work of researchers. Evidence of a more productive library might include more journal articles published by the university community, more grants received, or, simply, more patrons visiting and using the library. However, Richard Meyer concludes that teaching faculty in universities with libraries that have faculty status are less productive, not more.[9] Another assumed benefit of faculty status is that the time and effort spent on achieving faculty status should "pay off" for the library and the librarian, resulting in a higher salary. However, although Meyer showed that faculty and librarian salaries were on a par at one particular institution, Clemson University, other research has shown the contrary—that either there is no statistically significant

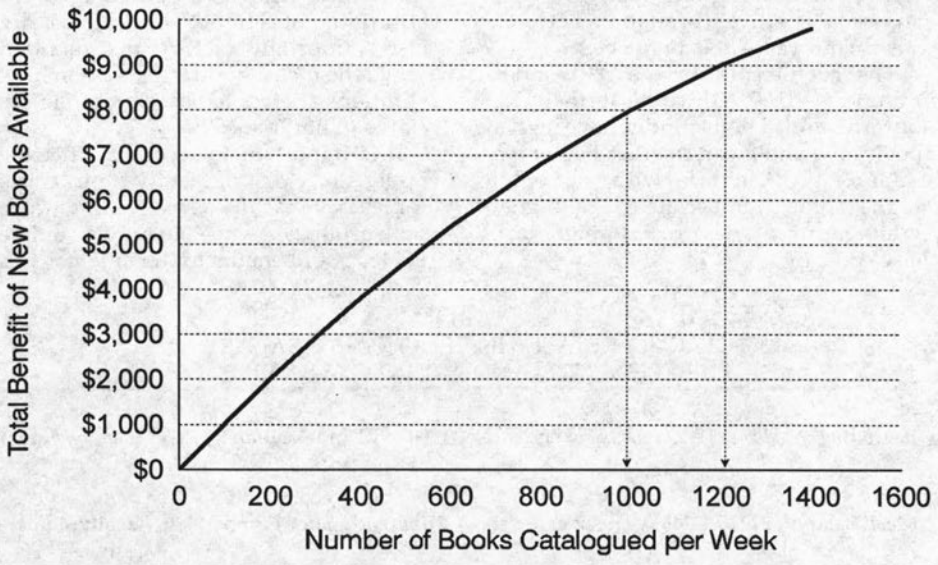

FIGURE 2
The Total Benefit of New Book Use per Week

difference or that salaries are lower in institutions with faculty status.[10–12]

The effect of faculty status on librarian salaries can be checked using data on ARL libraries' beginning and mean salaries and average years of experience, ARL index numbers, and whether or not librarians have faculty status.[13–15] ARL index numbers are calculated from volumes added to collections, staff size, collection size, total serial holdings, and budget. These secondary data, arguably imperfect, can be considered reasonable proxies for library status, quality, and level of institutional support. When beginning and average salaries for university libraries at 101 ARL libraries were regressed on faculty status, average years of experience, and the ARL index number, the results shown in table 1 were obtained.

The coefficients on the years of librarian experience (+1112, +248) indicate that libraries with higher average years of experience pay their librarians more.[16] A library with an average of fifteen years of librarian experience has a mean salary, on average, $248 higher and a beginning salary, on average, $1,112 higher than a library with an average of fourteen years of librarian experience. This shows a positive correlation between salary and years of experience.

The coefficients on the ARL index numbers (+1150, +812) indicate that ARL libraries with a higher index have higher beginning and mean salaries. Beginning salaries at ARL libraries with a one point higher index number are $1,550 higher while mean salaries are $814 higher, all else constant.

However, the coefficients and standard errors for faculty status indicate that there is no statistically significant effect of faculty status on librarian salaries at ARL libraries. In addition, the coefficients on faculty status (-1118, -46) are negative; i.e., faculty status results in lower salaries, not higher. While there may be other benefits to faculty status such as paid leaves, travel support, or other fringe benefits, there is no evidence of an increase in salary.

As an additional check, the effect of faculty status on the ranking of an ARL library was examined. If faculty status provides a benefit of increased productivity, it would be expected that more productive university libraries would be more likely to have faculty status. However, when the correlation between the ARL index number and faculty status is calculated, the correlation coefficient is -0.14. This indicates that the typical university library with faculty status has a mean ARL index number 0.14 less than the typical university library without faculty status. Charles Lowry's research shows that institutional status (private or public) and classification (from the Carnegie Classification of Institutions of Higher Education) are also important factors that explain why "the oldest and largest research institutions are less likely to grant faculty status to librarians."[17]

It is important to recognize that the opportunity cost of faculty status exists for teaching faculty as well as librarians. Both groups may need to provide ample evidence of benefits to the university in

TABLE 1
FACULTY STATUS IN RELATION TO SALARY, EXPERIENCE, AND ARL INDEX NUMBER

Beginning = 24447 +	1112 (years of experience)	+ 1550 (ARL index number)	- 1118 (faculty status)
	(224)	(510)	(971)
Mean Salary = 22225 +	248 (years of experience)	+ 814 (ARL index number)	- 46 (faculty status)
	(118)	(267)	(510)

Note: Standard errors are in parentheses. Faculty status is a dummy variable that takes on the value of 1 when the library has faculty status and 0 otherwise.

order to justify the short-term and long-term costs of giving employees lifelong contracts. Faculty status may or may not work to the institution's advantage. However, that decision can only be made when both the benefits and the costs of faculty status are considered.

The philosophical debate as to the pros and cons of faculty status for academic librarians will probably continue *ad infinitum*. In January 1992, ACRL sponsored a think tank to focus on issues evolving from faculty status for academic librarians. The subsequent report—"Faculty Status: 2001"—outlined an agenda to strengthen the concept of faculty status during this decade.[18] This agenda has met with some negative reaction.[19] Beth Shapiro's rebuttal of ACRL's position drew an immediate and lively response from the readership, ample proof that this topic is still being hotly debated.[20]

The high cost of doing business in the Information Age and the escalating cost of acquiring materials have contributed to an increased concern with the economics of library operations.

At the same time, the workloads of individual librarians are increasing. Automation of library functions (both managerial and patron driven) has added new services, increased workloads, heightened the need for retraining and additional computer skills, and contributed to both the burnout and stress levels attested to in the literature.[21] Librarians are rethinking their modus operandi in response to the Digital Revolution and changing models of information delivery.[22] The move toward the Virtual/Digital/Electronic Library is bringing librarians closer to their colleagues in the Computing Center who do not usually have faculty status (see Diane Cimbala's discussion of the issue of faculty status in her model for a "scholarly information center").[23] Will there be a trend toward combining all information jobs into one (or several) information families? Certainly if Anne Woodsworth and Theresa Maylone's conclusions hold true, a move from faculty lines to computing lines would have financial benefits that, according to Applegate, faculty status has not provided.[24,25]

Academic libraries are currently being compelled to look at the economics of library services. The high cost of doing business in the Information Age and the escalating cost of acquiring materials have contributed to an increased concern with the economics of library operations. It is unlikely that any administrator attuned to the sensitivity of the issue of faculty status among librarians would seriously consider changing the status quo unless there was a strong and reasoned demand for change on the part of the library faculty. However, since faculty status for librarians is not cost neutral, campus administrators would do well to integrate this fact into their thinking as they look at revised models of information delivery across the campus. Librarians would also be advised to analyze how well the faculty status model has served their purposes over the years and whether or not, as Fred Batt states, force-fitting librarians into the teaching faculty mode is comfortable.[26] If this model is found to be lacking, then perhaps it is time to develop a new model that more appropriately serves the patrons' and the librarians' needs in this brave new world of electronic resources and information access.

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Research Notes

The "Known" in Known-Item Searches: Empirical Support for User-Centered Design

Barbara M. Wildemuth and Ann L. O'Neill

Traditionally, the catalog record for an item has been based on the cataloger's inspection of the item and has contained a complete description of the item. An alternative approach—user-centered design—would require the study of user behaviors and cognition related to interaction with the catalog and using the results of those studies to inform design decisions. To support known-item searches, one would need to study users' conceptions of the item being sought, what the user knows about the item, and which pieces of known information are viewed by the user as most appropriate for inclusion in a search. A pilot study was conducted to develop methods that can be applied to these questions. During the three phases of the study, 103 catalog users described 386 searches. Any written information known by the searchers was photocopied. The searchers generally knew the title, publication date, page numbers (particularly for journals), and/or the author (particularly for books). The information known by the searcher was usually accurate. Results from the study indicated that the method was feasible and valid, and provided a preliminary picture of known-item searching in one library's catalog.

Some people who approach a library catalog have a particular item in mind, and they want to determine whether the library holds that item and where in the library it is located. Such a person would conduct a known-item search. A known-item search may include the author, the title, the subject, or a combination of these and other pieces of information to identify the item in the catalog. Inclusion of a piece of information in the known-item search presumes that the searcher knows that piece of information.

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Traditionally, the catalog record has been conceptualized as a surrogate for an item. Since all possible searches for that item cannot be anticipated, the goal is comprehensive description of the item based on the cataloger's inspection of it. Though attempting to serve the user's goals, the design of such a catalog is system-oriented, i.e., the designers use knowledge of the system (including the items being described) to design the catalog.

An alternative approach is user-centered design.[1] Applying this approach would require the study of user behaviors and cognition related to use of the catalog and using the study results to inform design decisions. To support known-item searches, one would need to study users' conceptions of the item being sought (e.g., how vague/clear is the user's image of the item?), what the user knows about the item, and which known information is viewed by the user as most appropriate for inclusion in a search.

The pilot study described here was conducted to develop and test methods for determining (1) which data elements related to known-item searches are possessed by catalog users and (2) the utility of those data elements in conducting catalog searches. This study is a methodological precursor to a large-scale study of known-item searches. In addition, this article reports preliminary results from the pilot study.

LITERATURE REVIEW

Most studies of online public access catalogs (OPACs) have focused on user satisfaction, system features, interface design, system response time, or subject searches conducted. There have been only a few investigations of known-item searching, and even fewer studies of the information brought to the catalog to conduct a known-item search. The literature on known-item searches addresses three questions:

- What percentage of catalog searches are known-item searches?
- What types of errors occur in known-item searches?
- What information do people bring to the catalog to search?

Transaction log analyses and surveys have been used most often to obtain data on OPAC use. Academic libraries have been investigated more frequently; however, a few public libraries were covered also.

Many of the studies that address known-item searching were conducted in the early 1980s. Of particular note are the cross-institutional studies sponsored by the Council on Library Resources (CLR).[2] At the time of these studies, OPACs were relatively new. Many search features have been improved in today's online catalogs and library users are more accustomed to OPACs. Therefore, the results reported in this review may not apply to today's catalogs and their users.

What Percentage of Catalog Searches Are Known-Item Searches?

Because transaction logs generally are examined after the search, it is impossible to determine the type of search reliably.[3] Some people use either the author or title of a known work as a starting point in a subject search. The interpretation of keyword searches is also ambiguous. For example, MELVYL, the University of California OPAC, assumes that all title searches are keyword searches unless an exact-title command is specified. Some title keyword searches may actually be subject searches. John Akeroyd claims that searches performed solely to identify items on a particular subject may account for as much as 24 percent of all author/title searches.[4] One study found that, of fifty searches, three author and two title searches (10 percent of the total) were actually subject searches, and another found that 43 percent of the catalog searches for a specific item were subject searches or hybrid subject/known-item searches.[5,6] At Yale University, it was found that 73 percent of the card catalog users stated that they were looking for a specific item, but almost one-third of them believed they could find the desired information in some other publication.[7] Conversely, a subject search could be conducted to identify a known item.

A study based on researcher-specified queries found that 27 percent of the card catalog searches for the "Warren Report" began with a subject search, and a naturalistic study found that 6 percent of known-item searches in a card catalog began with a search for a subject heading.[8,9]

In spite of the ambiguity involved, several studies have categorized the type of search conducted based on examination of transaction logs (see table 1). In the table, author, title, and call number searches are considered known-item searches. The row totals represent the proportion of all searches in the transaction logs that were known-item searches; the remaining proportion (not shown) were subject searches. The results are reviewed here, beginning with the most recent. At North Carolina State

TABLE 1
PERCENTAGE OF SEARCHES BY TYPE,
BASED ON TRANSACTION LOG ANALYSIS

		Type of Known-item Search					
Study	Library	Author	Title or Series Title	Author and Title	Title Keyword	Call Number	Row Total
Akeroyd, 1990	South Bank Polytechnic	24%	55%				79%
Akeroyd, 1990	Stirling University	35%	21%		16%		72%
Akeroyd, 1990	Polytechnic of Central London	18%		39%	21%		78%
Chang, 1986	University of North Carolina	27%	27%				54%
Holmes and Bulger, 1988	University of Ottawa	23%	34%	8%	3%	3%	71%
Hunter, 1991	NC State University	21%	26%			0%	47%
Matthews, Lawrence and Ferguson, 1983	University of California (command mode)	28%	24%				52%
Matthews, Lawrence and Ferguson, 1983	University of California (lookup mode)	30%	41%				71%
Matthews, Lawrence and Ferguson, 1983	Northwestern University	31%	38%				69%
Matthews, Lawrence and Ferguson, 1983	Claremont Colleges	35%	18%			2%	55%
Matthews, Lawrence and Ferguson, 1983	Mankato State University	12%	16%	7%	3%		38%
Matthews, Lawrence and Ferguson, 1983	Mission/West Valley Colleges	16%	19%	0%		2%	37%
Matthews, Lawrence and Ferguson, 1983	Pikes Peak Library District	13%	40%				53%
Peters, 1989	University of Missouri, Kansas City	23%	1%		34%	1%	59%
Tolle, 1983*	Dallas Public Library	9%	10%	2%		3%	24%
Zink, 1991	University of Nevada, Reno	13%	19%				32%

* In addition to subject searches (38 percent of the total), Tolle's data included Begin and End commands (18 percent each) and errors (2 percent).

University 47 percent of the searches were for authors or titles, while 32 percent of the searches at University of Nevada, Reno, were for authors or titles.[10,11] Author, series, and title searches for known items accounted for 56 percent of the searches at Stirling University, while searches for authors and titles accounted for 79 percent at South Bank Polytechnic, and searches for authors accounted for 18 percent at the Polytechnic of Central London (where all title searches were by keyword).[12] Of the searches conducted on the University of Missouri Information Network, 24 percent were for authors or titles.[13] Fifty-seven percent of the searches at the University of Ottawa were for an author or a title.[14] In a preliminary study of the online catalog at the University of North Carolina at Chapel Hill, 27 percent of the commands were for author searches and 27 percent were for title searches.[15] CLR study results indicated that over half the searches were for authors or titles at Northwestern University, the University of California, the Claremont Colleges and Pikes Peak [public] Library District, while only 28 percent of the searches at Mankato State University and 35 percent of the searches at the Mission/West Valley [community] Colleges were for authors or titles.[16] Only 19 percent of the searches at the Dallas Public Library were based on authors or titles.[17] As summarized in table 1, different studies have found quite different results in the number of author and title searches conducted.

Some systems support searches of author/title combinations. For example, at Ohio State University, derived author/title search keys (e.g., 4,4 or 4,3,3,2) make possible the author/title search feature. Combination author/title searches made up 39 percent of the searches at the Polytechnic of Central London, but were much less common at other libraries (8 percent of the searches at the University of Ottawa, 2 percent of those at the Dallas Public Library, and less than 1 percent of those at the Mission/West Valley Colleges).[18–21]

Other systems have a title keyword feature, allowing users to search for any word in a title, rather than being restricted to words at the beginning. The classification of these searches as known-item searches particularly is open to question. Title keyword searches accounted for 16 percent of the searches at Stirling University, 21 percent at Polytechnic of Central London, and 34 percent at the University of Missouri–Kansas City.[22–24] The same searches accounted for only 3 percent at the University of Ottawa and at Mankato State University.[25,26]

Numeric searches for known items (e.g., using call number, ISSN, or ISBN) are a very small percentage of the searches. In most transaction log studies, numeric searches are attributed to staff and discounted from further analysis. When the percentage of numeric known-item searches is reported, it ranges from less than 1 percent to 3 percent.

Surveys and interview studies of the types of catalog searches conducted are listed in table 2. The percentages in this table represent the proportion of all the respondents that reported conducting each type of search; the remaining searches (not reported) were subject searches. These studies were more consistent in the proportion of known-item searches found: 48 percent at Ohio State University; 33–36 percent in the University of California system; and 41–50 percent across the libraries participating in the CLR study.[27–29] For comparison, an earlier study of card catalog use found that 56 percent of the users were looking for a specific document and 11 percent of the users were conducting searches for a particular author or for bibliographic verification.[30]

In summary, transaction logs have indicated that between 24 percent and 78 percent of OPAC searches are for authors or titles. Surveys have found that between 33 percent and 67 percent of the searches are for known items. Based on these data, it can be concluded that known-item searching is an important function that should be supported by a library catalog.

What Types of Errors Occur in Known-Item Searches?

In the studies cited here, a search statement generally is categorized as an error

TABLE 2
PERCENTAGE OF SEARCHES BY TYPE, BASED ON INTERVIEW DATA

Study	Library (Question Asked)	Type of Known-item Search: Author	Title	Author and Title	Known Document	Bibliographic Verification	Row Total
Alzofon and Van Pulis, 1984	Ohio State University (command used)	14%	18%	16%			48%
Lawrence, Graham and Presley, 1984	University of California (information brought to search)	14%	6%	13%			33%
Lawrence, Graham and Presley, 1984	University of California (purpose of search)				36%		36%
Lawrence, Graham and Presley, 1984	Multiple libraries (information brought to search)	14%	12%	18%			44%
Lawrence, Graham and Presley, 1984	Multiple libraries (purpose of search)				50%		50%
Lipetz, 1970	Yale University card catalog (purpose of search)	6%			56%	5%	67%

if it retrieves no citations. Most studies have not tried to determine whether zero-retrieval is due to the fact that the library does not hold the desired item. When such collection failures were taken into account, an adjusted error rate is reported. A few studies have defined errors based on an evaluation of the quality of the search statements, rather than the outcome of the search.[31,32]

Overall failure rate for known-item searches varies from study to study. In the CLR study, users were asked whether their searches were successful. Sixteen percent said that they did not find any of the items sought.[33] Other studies estimated success based on transaction logs. Naturalistic studies conducted at Ohio State University found that 10 to 15 percent of the search sessions contained only errors, and that 17 to 25 percent of the title searches in departmental library catalogs were unsuccessful.[34,35] Errors occurred in 37 percent of the title searches and 22 percent of the author searches conducted at Northwestern University.[36] For 44 percent of the known-item searches in an online circulation system at the University of Illinois, the item was not found, even though it was in the system.[37]

Several researchers examined search failures in more detail. In most studies, typographical errors or misspellings were frequent. At Northwestern University 54 percent of the errors in title searches, excluding collection failures, were typographical or spelling errors, and a reanalysis of a portion of that data found that 36 percent of the errors in author searches were typographical, excluding collection failures.[38,39] Excluding collection failures, 60 percent of the errors in title searches and 30 percent in author searches on the University of Missouri Information Network were typographical errors or misspellings; the comparable error rates at the University of Nevada, Reno, were 37 percent of the unsuccessful title searches and 42 percent of the unsuccessful author searches.[40,41] Even in a smaller study of experienced catalog users, 5 percent of the errors were typographical.[42] Based on analyses of both failed and successful searches, two studies found that typographical errors occurred in 10 percent of the searches and another found that such errors oc-

curred in 7 percent of the searches.[43,44] In summary, typographical errors or misspellings accounted for approximately one-third of the errors made in conducting known-item searches in online catalogs.

Another common error involved the search mode. In most catalogs the type of search must be specified prior to entering the search term, and users experience confusion about search mode (e.g., they enter an author's name while in subject search mode). Two studies conducted at the University of North Carolina found that the user's failure to specify a search mode accounted for 18 percent and 14 percent of the errors, respectively.[45] At Northwestern University such errors accounted for 8 percent of the title search errors and 6 to 7 percent of the author search errors, excluding collection failures.[46] The comparable rate at the University of Missouri was 16 percent.[47] At the University of Nevada, Reno, mode errors occurred even more frequently, accounting for 60 percent of the errors among title searches, excluding collection failures.[48] The wide variation in the rate of mode errors is most likely due to differences in catalog design, i.e., the visible cues for specifying search type.

In author searches, a frequent error was to leave the name uninverted (e.g., Mark Twain instead of Twain, Mark). Excluding collection failures, 36 percent of the errors in author searches at the University of Nevada, Reno, could be attributed to uninverted names.[49] The comparable error rate at Northwestern University was 22 to 24 percent; and at the University of Missouri was 19 percent.[50,51] At the University of Ottawa, name inversion errors occurred in 6 percent of the author searches.[52]

A frequent error in title searches was the inclusion of an initial article in the search term, accounting for 20 to 26 percent of the errors at the University of North Carolina at Chapel Hill, and for 26 percent at Northwestern University, excluding collection failures.[53,54] Only these three studies examined this type of error, but the results are strikingly consistent and show a high failure rate.

In summary, users are unsuccessful in approximately one-quarter of their known-item searches. Researchers attribute these search failures to a variety of causes. The most consistent finding is that many typographical and spelling errors are made. In addition, users experience difficulty in expressing bibliographic information in the form required by the catalog and in handling command syntax.

What Do Users Bring to the Catalog to Search?

Empirical data concerning the bibliographic information brought to a search of an online catalog are almost nonexistent. The CLR study examined this issue in the most detail, asking catalog users what information they possessed (author, partial author, title, partial title, subject heading, etc.) and which information they used in their search.[55] David Holmes and Derrick Bulger reported that very few searches incorporated more data than that included in a brief cataloging record, i.e., bibliographic elements other than author, title, date, or call number.[56] Jerry Specht asked subjects what information they brought to the search, but reported this information only as "known-item" or "location" search.[57] Two earlier studies, included in this review, were conducted of the bibliographic information users brought to searches of a card catalog.[58]

The CLR survey indicated that, across both known-item and subject searches, 50 percent of the users knew the author's name, and 48 percent knew the title.[59] Earlier studies of card catalog use delved more deeply into the completeness and accuracy of the bibliographic data possessed by users. At Yale University 77 percent of those conducting known-item searches knew the author, 97 percent knew the title, and 59 percent had date information. However, only 42 percent had completely accurate author information, only 62 percent had accurate title information, and only 29 percent were within one year of the correct publication date.[60] In a study of known-item searches at three university libraries and one public library, 70 percent of the titles

were complete and accurate and 60 percent of the authors' last names were complete and accurate.[61] These results should be applied to OPAC design with caution, however, because "minor discrepancies" in spelling were disregarded.[62] These discrepancies might not disturb card catalog searches but could result in failure of an online catalog search.

From these studies, it can be concluded that people often bring basic bibliographic data to the catalog, but that there are often inaccuracies in the data, some of which have significant negative effects on the search outcomes.

RESEARCH QUESTION

The research reviewed above indicates that known-item searches account for a significant proportion of online catalog searches. Therefore, it is worthwhile to try to improve users' effectiveness in conducting such searches. It is also clear that typographical and spelling errors are often the cause of search failures. Based only on an examination of transaction logs, it cannot be determined whether these spelling problems are related to the user's typing skills or the inaccuracy of the bibliographic data they possess. Studies of card catalog use indicate that users often have basic bibliographic data available to support their searches, but their data often contain inaccuracies.

In a user-centered approach to catalog design, all these findings are helpful. However, gaps in our knowledge remain. The current study was intended to test a method for addressing three research questions: (1) Of the many data elements that could be used to describe a bibliographic entity, which data elements do users bring with them to support their known-item searches? (2) How accurate is their recording or memory of those data elements? and (3) How successful are OPAC searches that employ those data elements?[63]

METHOD

In order to develop a method for addressing these research questions, an interview protocol was developed to determine what type of search the user was conducting, which data elements the user possessed prior to beginning the search, and whether the user considered the search successful. (The interview results will be integrated with transaction log analysis when the full-scale study is conducted in order to evaluate the relationship between the bibliographic data possessed and that used in the search.) This section describes the final instrument and the evolution of the interview protocol over three phases of data collection. In the next section, the preliminary results generated during the pilot study are reported.

All the interviews were conducted in Davis Library at the University of North Carolina at Chapel Hill (UNC). Data collection periods were approximately 1.5 to 2 hours and were staggered to cover class changes. Data collection was scheduled at different times between 10:00 a.m. and 8:00 p.m. to determine periods of heavy use. The online catalog software was a customized version of the catalog available from Data Research Associates (DRA). Public online catalog terminals were available on the main floor of the library and on each floor of the library stacks. During each three-day data collection phase, one of the investigators was stationed near the catalog terminals.

Respondents were selected from those who approached the terminal area but had not yet started their search. With the exception of library staff, repeat users, and students working in groups, every person that approached a terminal while the investigator was not occupied with another respondent was invited to participate in the study. Only those who said they were searching for known items ("an author," "a book," "a journal") were asked all questions.

The first draft of the survey instrument was derived mainly from questions on the CLR study survey.[64] Questions were open-ended to accommodate the full range of responses. The interview covered the type and purpose of the respondent's search(es), the bibliographic information possessed by the respon-

dent (either written or remembered), the respondent's evaluation of the success of the search, and the discipline and academic status of the respondent.

The first set of interviews was conducted in mid-October 1993. If the respondent brought written information to the terminal, permission was asked to photocopy that information (a desktop copier was moved to the online terminal area for this purpose). If the respondent did not have written information, all information known about the desired item(s) was recorded, spelled as reported by the respondent. After the search was completed, the respondent was asked whether the desired item was found and, if not, whether other items of interest were identified.

The second set of interviews was conducted in early November. In this phase, response categories were specified for all questions, call number verification was added as a type of search, and the interviewer asked in more detail about the bibliographic information known and the source of that information.

The third and final set of interviews was conducted in mid-November. By this time, all questions were closed-ended. For several questions, an "other" response category was still available and, where appropriate, the interviewer specified the user's response. The final form of the interview protocol is included in the appendix.

In addition to the interviews, the data reported in the next section include the outcomes from a replication of each search by a member of the research team, based on the information possessed by the user at the time of the interview. The outcomes of these searches can then be compared with the outcomes reported by the respondents at the completion of their searches.

RESULTS

One hundred eighty-three people were invited to participate in the study. Of this number, 58 (32 percent) were conducting subject searches and 22 (12 percent) declined participation, resulting in 103 interviews of people conducting known-item searches.

Table 3 presents the academic status and academic departments represented among the 103 respondents. Approximately three-quarters of the respondents were students, split fairly evenly between undergraduate and graduate students. The individual academic departments represented most frequently were English (9), psychology (9), education (7), political science (7), and sociology (7). The prevalence of departments in the social sciences and humanities can be attributed to the fact that these departments are primarily served by Davis Library, while many of the departments in the natural sciences (including the health sciences) have departmental libraries.

TABLE 3
ACADEMIC STATUS AND DEPARTMENT OF RESPONDENTS

Department	Faculty	Undergraduate Student	Graduate Student	Local/ External/ Library Staff	Total
Humanities*	3	6	17	0	26
Social sciences†	5	22	29	0	56
Natural sciences‡	1	6	2	0	9
Undeclared/not applicable	1	4	1	6	12
Total	10	38	49	6	103

* Departments in the humanities category included English, Slavic languages, Romance languages, German, classics, history, art, art history, music, philosophy, and religious studies.

† Departments in the social sciences category included anthropology, sociology, psychology, clinical psychology, business, economics, political science, international studies, womens' studies, education, information and library science, journalism, RTVMP (radio, television, and motion pictures), and leisure studies.

‡ Departments in the natural sciences category included biology, physical education, geography, medicine, nursing, psychiatry, and pharmacy.

Because this was a pilot study intended to design an interview protocol, the questions asked in the three phases varied slightly. Wording was changed or response categories were added as data were collected. Whenever possible, earlier open-ended responses were categorized based on the final form of the interview schedule. The fact that this was a pilot study also affected analysis of the data. Initially respondents were considered the unit of analysis, but later it became clear that the item sought was also an appropriate unit of analysis. Unfortunately, some per-item data from the first phase was unavailable.

Of the people conducting known-item searches, 57 had written information describing 338 items. They were categorized as having hand-written notes; informal bibliographies, including class reading lists; or published references, bibliographies, and search printouts. The other 46 people, searching for 48 items, did not have any written description of the item(s). The type of item sought and the form of the information known is displayed in table 4. Most of the items sought were books and journals. Most of the journal citations were drawn from published bibliographies or CD-ROM searches. All the videos sought were from a list provided by a faculty member.

Respondents knew the title for 94 percent of the items sought (see table 5). Publication date was known for 70 percent of all the items and for 97 percent of

TABLE 4
TYPE OF ITEM SOUGHT BY FORM OF INFORMATION KNOWN

Type of Item Sought	Recalled from Memory	Hand-written Notes	Informal Bibliographies	Bibliographic Search Results or Published References	Total
Book	41	60	78	61	240
Journal	6	20	11	74	111
Video	0	0	33	0	33
Other	1	0	0	1	2
Total	48	80	122	136	386

TABLE 5
BIBLIOGRAPHIC INFORMATION KNOWN ABOUT THE DESIRED ITEM

Data Element	Recalled from Memory		Hand-written Notes		Informal Bibliographies		Bibliographic Search Results or Published References		Items from All Sources	
Author(s)	28	58%	48	60%	65	53%	41	31%	182	48%
Editor(s)	2	4%	4	5%	14	11%	11	8%	31	8%
Title or partial title	33	69%	73	91%	122	100%	132	100%	360	94%
Publisher*	3	6%	22	28%	36	30%	40	31%	101	27%
Date of publication*	4	8%	45	56%	92	75%	128	97%	269	70%
Subject*	9	19%	5	6%	33	27%	47	36%	94	25%
Page number(s)	1	2%	10	13%	11	9%	78	59%	100	26%
Other	6	13%	3	4%	35	29%	7	5%	51	13%
Total items from each source†	48		80		122		132		382	

Total number of items analyzed = 382. Data from four of the respondents in the first phase could not be analyzed.

* Data on publisher, subject and other information from a fifth respondent could not be analyzed, so the base number of items in those categories was 381.

† A respondent may know more than one data element per item, so the column total will be greater than the total number of items. The percentages reported use the total number of items from each source as the denominator.

the items for which the respondent had a published record of the citation. The author's name was known for almost half the items. The page number was known for over half of the items where the respondent was consulting a published reference list or the output of a computer-assisted bibliographic search. Other frequently known data elements included the subject and publisher. All of these data elements would be available to someone conducting an OPAC search.

Data elements known for books differed from those known for journals (see tables 6 and 7). Titles were known for virtually all items—both books and journals. Authors were usually known for books, but were not relevant when seeking the location of a journal. Publication date was almost always known for journals, but was known for only about half of the books. Page numbers were known for 80 percent of the journal items sought, but for only 4 percent of the

TABLE 6
BIBLIOGRAPHIC INFORMATION KNOWN ABOUT BOOKS

Data Element	Recalled from Memory		Hand-written Notes		Informal Bibliographies		Bibliographic Search Results or Published References		Items from All Sources	
Author(s)	28	68%	47	78%	65	83%	41	72%	181	77%
Editor(s)	2	5%	4	7%	14	18%	10	18%	30	13%
Title or partial title	26	63%	53	88%	78	100%	57	100%	214	91%
Publisher	2	5%	22	37%	36	46%	38	67%	98	42%
Date of publication	3	7%	25	42%	50	64%	55	96%	133	56%
Subject	8	20%	3	5%	25	32%	40	70%	76	32%
Page number(s)	1	2%	2	3%	1	1%	6	11%	10	4%
Other*	5	13%	2	3%	2	3%	5	9%	14	6%
Total from each source†	41		60		78		57		236	

Total number of items analyzed = 236. Data from four of the respondents in the first phase could not be analyzed.
* Data on other information known about journals from one additional respondent could not be analyzed.
† A respondent may know more than one data element per item, so the column total will be greater than the total number of items. The percentages reported use the number of items from each source as the denominator.

TABLE 7
BIBLIOGRAPHIC INFORMATION KNOWN ABOUT JOURNALS

Data Element	Recalled from Memory		Hand-written Notes		Informal Bibliographies		Bibliographic Search Results or Published References		Items from All Sources	
Author(s)	0		1	5%	0		0		1	1%
Editor(s)	0		0		0		0		0	
Title or partial title	6	100%	20	100%	11	100%	74	100%	111	100%
Publisher	1	17%	0		0		1	1%	2	2%
Date of publication	1	17%	20	100%	9	82%	72	97%	102	92%
Subject	0		2	10%	8	73%	7	9%	17	15%
Page number(s)	0		8	40%	10	91%	71	96%	89	80%
Other	1	17%	1	5%	0		2	3%	4	4%
Total from each source*	6		20		11		74		111	

Total number of items analyzed = 111.
* A respondent may know more than one data element per item, so the column total will be greater than the total number of items. The percentages reported use the number of items from each source as the denominator.

books. When considering the user's purposes in searching the online catalog for these types of items, such differences are not surprising.

The origin of the information known by the user was analyzed in table 8. One-quarter of the items were identified through CD-ROM searches. Professors/teachers (16 percent) and class reading lists (13 percent) also were mentioned frequently. For those people without written information, prior use of the item was mentioned frequently. In addition to these common information sources, responses such as overdue notices and publishers' flyers were categorized as "other."

Each respondent reported the purpose of the search (see table 9). Completing a class assignment was the reason mentioned most frequently for needing an item, accounting for almost half the items. Other research, such as proposal writing, presentations, or editing a work, was also common, as were preparing a dissertation or thesis and studying for comprehensive exams. Personal use or leisure reading was most common among people who did not have written information, and studying for comprehensive exams was most common among people using informal bibliographies.

TABLE 8
ORIGIN OF BIBLIOGRAPHIC INFORMATION

Origin of Bibliographic Data	Recalled from Memory		Hand-written Notes		Informal Bibliographies		Bibliographic Search Results or Published References		Items from All Sources	
Professor/teacher	9	21%	13	17%	35	29%	2	1%	59	16%
Class reading list	6	14%	12	16%	30	25%	0		48	13%
Reference in book	2	5%	14	19%	0		4	3%	20	5%
Reference in journal	1	2%	23	31%	0		4	3%	28	7%
CD ROM search	1	2%	10	13%	0		82	60%	93	25%
Friend	2	5%	2	3%	0		0		4	1%
Used item before	7	17%	0		0		3	2%	10	3%
Saw item before	3	7%	1	1%	1	1%	0		5	1%
Other	11	26%	0		56	46%	41	30%	108	29%
Total number of items	42		75		122		136		375	

Total number of items analyzed = 375. Information about the origin of the information was not provided for 11 of the items.

TABLE 9
PURPOSE OF SEARCH

Purpose of Search	Recalled from Memory		Hand-written Notes		Informal Bibliographies		Bibliographic Search Results or Published References		Items from All Sources	
Class assignment	22	46%	38	48%	29	24%	91	67%	180	47%
Other research	5	10%	25	31%	25	21%	11	8%	66	17%
Dissertation/thesis	2	4%	12	15%	0		26	19%	40	10%
Comprehensive exams	1	2%	0		32	26%	0		33	9%
Preparation for class	4	8%	0		1	1%	4	3%	9	2%
Verify a reference	1	2%	2	3%	1	1%	0		4	1%
Personal use	8	17%	3	4%	0		0		11	3%
Other	5	10%	0		33	27%	4	3%	42	11%
Total number of items	48		80		121		136		385	

Total number of items analyzed = 385. Data from one respondent in the first phase could not be analyzed.

Each respondent was asked to return after completing the search and report whether the desired items were found. Almost all the respondents complied with this request, so the searcher's assessment of his or her success was known for 92 percent of the items. Most catalog users (70 percent) said they found the items they were seeking (see table 10). Surprisingly, the more formal the source of the bibliographic data, the less likely that the user conducted a successful search, with the highest success rate reported for items recalled from memory.

To verify the success rates of the respondents, a member of the research team replicated the search for each item. For 14 items, the search could not be replicated because the respondent did not share the citation details with the researchers. The results from the replicated searches are presented in table 11. The researcher's success rate was very close to that of the original searcher when the original searcher's information matched the catalog record. Four author names, one editor name, and six titles provided by respondents were inaccurate. Additionally, 14 search failures can be attributed to the evolving medium of the catalog, i.e., they were in the collection but had not yet been added to the online catalog. It can be concluded that, with accurate citation data, respondents successfully used the current online catalog for known-item searches.

DISCUSSION

The purposes of this study were twofold: first, to develop and validate a

TABLE 10
SELF-REPORTED SEARCH SUCCESS

	Recalled from Memory		Hand-written Notes		Informal Bibliographies		Bibliographic Search Results or Published References		Items from All Sources	
Successful	38	84%	51	72%	74	69%	85	65%	248	70%
Not successful	7	16%	20	28%	33	31%	46	35%	106	30%
Total items for which success was reported	45		71		107		131		354	
Items for which success was not reported	3		9		15		5		32	

TABLE 11
SUCCESS OF REPLICATED SEARCHES

	Recalled from Memory		Hand-written Notes		Informal Bibliographies		Bibliographic Search Results or Published References		Items from All Sources	
Successful replications										
Citation correct	31	82%	57	71%	84	69%	79	60%	251	67%
Citation incorrect	6	16%	5	6%	0		0		11	3%
Citation in prior catalog	0		2	3%	0		12	9%	14	4%
Unsuccessful replications										
Item not in collection	1	3%	16	20%	38	31%	41	31%	96	26%
Total searches replicated	38		80		122		132		372	
Items not replicated (citation not known)	10		0		0		4		14	

Column percentage totals may not equal 100 percent, due to rounding error.

method for collecting data concerning the information known by online catalog users and, second, to provide preliminary data concerning that information. It was successful in each of these two objectives.

The methodological result of the study is a structured interview protocol that can be used to gather data concerning the information possessed by online catalog users. The protocol (in the appendix) first identifies those users intending to conduct a known-item search, then asks about the information possessed by the respondent, the source of that information, and the purpose(s) of the search. Next, it covers the academic status and discipline of the respondent. Finally, it asks for the respondent's perspective on the success of the search. The use of a desktop photocopier in conjunction with the interview was found to be an efficient and cost-effective means of accurately capturing written or printed citation data possessed by the respondent.

Because this was a pilot study of a small sample, the results may not be generalizable beyond the current respondents. Some preliminary conclusions about catalog use can, however, be drawn. First, of the 160 catalog users who did not decline participation, only 36 percent were conducting subject searches; the remaining 64 percent were conducting known-item searches. Second, the information about an item may be recalled from memory or recorded in hand-written notes, but most often (for 67 percent of the items) it is more formal, such as a class reading list or output from a bibliographic search. Third, known-item searches are primarily for books (about two-thirds) and journals (about one-third), and the data elements known about an item vary by the item's form. Titles are known for either type of item, but authors are known primarily for books, while date and page numbers are known primarily for journals. Fourth, over half the items originated with a professor or teacher, on a class reading list, or on the output from a CD-ROM search. Almost half the searches were conducted in connection with a class assignment. Finally, most (70 percent) of the searches were successful. Only a small proportion of the search failures (3 percent) could be attributed to inaccuracies in the information possessed by the respondents, and such inaccuracies occurred only when the re- spondent depended on his or her memory or hand-written notes.

The fact that these respondents were searching on recently implemented software had no detectable negative effect. Excluding collection failures, the few search failures that occurred can be attributed to inaccuracies in the citations—not to inadequacies in the catalog software. On the other hand, some people may have reported finding the desired item(s), even though they did not find exactly what they wanted, because of frustration with learning a new system. The availability of keyword searching, a new feature to UNC catalog users, may also lead to changes in the information that users bring to the catalog in the future.

A large-scale study based on the method described here could address several issues, such as the variability in the information possessed by catalog users and the accuracy of that information. However, one important question cannot be addressed by an interview: Of the information available, which is most likely to be used in a catalog search? The analysis of transaction logs would complete the picture by allowing connections to be made between the data elements available, the data elements included in the search, and the success of the search. Such an analysis should be integrated with future interview studies of catalog use.

IMPLICATIONS AND CONCLUSION

The results reported here provide a preliminary picture of the respondents' catalog use. A more complete picture would be provided by the large-scale study described above. Results from the large-scale study could be used to improve online catalogs by focusing our attention on those data elements most likely to be included in searches. In essence, the results could provide the

basis for decisions concerning the reduction of effort expended in descriptive cataloging.

However, there is one major shortcoming with this reasoning: it assumes that the primary use of the online catalog is to search for items—either for known items, as discussed in this paper, or for items on a given subject. Analysis of catalog use is incomplete without gathering additional data concerning nonsearch uses of the catalog, some of which may be specific to subsets of the user audience (e.g., a humanities scholar's use of details about the edition of an item). This study has not taken into account the existence of such variations in catalog use, and the method described here will not be effective in studying the frequency or quality of alternative uses. It is important to keep in mind that these results are limited to an examination of catalog searches.

Studies of catalog use from the user's perspective are important for the improvement of the services that libraries can offer. A long tradition of practice, based on the perspectives of professionals, is not a strong basis for the design of online catalogs. Instead, a user-oriented perspective should be adopted, so that we can design catalogs that further our primary goal: providing access to the intellectual content sought by our clients.

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61. Tagliacozzo, Rosenberg, and Kochen, "Access and Recognition."
62. Ibid., 234.
63. Ann T. Curran and Henriette D. Avram, *The Identification of Data Elements in Bibliographic Records, Final Report of the Special Project on Data Elements* (United States of America Standards Institute, Sectional Committee on Library Work and Documentation (Z-39), Subcommittee on Machine Input Records (SC-2), May 1967).
64. Matthews, Lawrence, and Ferguson, *Using Online Catalogs.*

APPENDIX
Interview Form for Study of Known-Item Searches

Date: _____ Survey # : _____

We are conducting a research project on how people use the online catalog. Would you be willing to participate? It will take less than five minutes.

1. What are you looking for today?
   - ☐ Subject search (Something on...)
     Thank you and stop.
   - ☐ Known item (A book, a book by...)
     Give the respondent the full consent form.
     ☐ Book ☐ Journal ☐ Verify call number
     Do you have any questions about the research? I would like to remind you that you may withdraw from the project at any time.

2. Did you bring any written information about the book/article with you?
   - ☐ Yes. May I see the information and make a copy of it?
   - ☐ No. What do you know about the item?
     ☐ Author ☐ Title
     ☐ Author and title ☐ Part of the title
     ☐ Editor ☐ Publisher
     ☐ Subject: _____
     Is there anything else you know about the item?

3. Where did you get this information?
   - ☐ Professor/teacher told me about it ☐ Friend told me about it
   - ☐ Class reading list
   - ☐ Reference in: ☐ Book ☐ Journal
   - ☐ Citation from: ☐ CD-ROM search ☐ Online search
     Database: _____
   - ☐ Other: _____

4. What will you be using the book/article for?
   - ☐ Class assignment ☐ Dissertation/thesis
   - ☐ Course preparation ☐ Verify reference(s) for publication
   - ☐ Personal ☐ Other research
   - ☐ Other: _____

5. I need to get some basic information about you. Are you a student or faculty member?
   - ☐ Undergraduate student ☐ Graduate student
   - ☐ Student from another school: _____
   - What department are you in? _____

   - ☐ Faculty ☐ Independent researcher/scholar
   - ☐ Faculty from another school: _____
   - What department are you in? _____

   - ☐ Member of local community ☐ Library staff
   - ☐ Other: _____

6. When you're finished using the online catalog, will you please come back and let me know whether you found the book/article in the catalog?

Time for start of search: _____ Time for return: _____

After the search:

7. Did you find what you were looking for?
   - ☐ Yes
     Did you get:
     - ☐ More than you needed
     - ☐ Exactly what you needed
     - ☐ Not what you were looking for, but similar items that will satisfy your need.
     - ☐ It was in another library. Which? _____
     - ☐ Other: _____
   - ☐ No
     - ☐ We don't own it.
     - ☐ It was checked out.
   - ☐ Other: _____

Book Reviews

Challenges in Indexing Electronic Text and Images. Ed. Raya Fidel, Trudi Bellardo Hahn, Edie M. Rasmussen, and Philip J. Smith. Medford, N.J.: Published for the American Society for Information Science by Learned Information, 1994. 306 p. (ISBN 0-938734-76-8).

As academic libraries continue to expand public access to diverse electronic information resources, they are providing increasingly new types of information beyond conventional bibliographic data. For a growing number of libraries, the World-Wide Web has transformed hypermedia from an intriguing futuristic possibility to a day-to-day reality. WAIS servers and CD-ROM systems have made full-text access equally commonplace. Specialized image systems are emerging, ranging from page-image databases of digital representations of printed materials to fine art databases of photographs, pictures, and other graphic material.

Given these trends, *Challenges in Indexing Electronic Text and Images* is a timely work. The book is organized into four sections: indexing and accessing images, indexing of hypermedia, computer support tools for indexers, and indexing and retrieval from full text. Papers in each section are introduced by one of the editors. The papers include research reports, discussions of particular systems and projects, theoretical treatises, and scholarly overviews of different areas of study.

Several papers in this volume are especially notable. Joseph A. Busch's paper discusses the specialized information needs of historical researchers, especially art historians, and describes how these needs are met by representative information retrieval systems. This paper underscores the fact that different disciplines have different information organization and retrieval needs, and, where feasible, we must build systems that address these unique requirements.

As hypertext documents proliferate because of the enormous popularity of the World-Wide Web, we are in desperate need of good design principles to improve navigation within and between these documents. Gary Marchionini's paper examines the relationship between indexing and hypertext, and he suggests that hypertext designers begin the document creation process by building an index to the projected work. This paper is a welcome reminder that the traditional principles of indexing are still valid and useful in new contexts.

While hypertext authors are being encouraged to discover conventional indexing techniques, commercial and nonprofit index publishers are investigating new techniques to improve the indexing process. One of the most interesting and potentially significant indexing strategies being employed is the use of "knowledge-based" indexing, which is derived from artificial intelligence and expert system research. Susanne M. Humphrey's paper surveys developments in this field, and describes her important MedIndEx prototype at the National Library of Medicine. A key challenge inherent in knowledge-based indexing is the effort required to encode a detailed store of knowledge about the subjects under consideration and their interrelationships.

The often bemoaned "information explosion," which has spawned a seemingly endless supply of texts to be indexed, motivates researchers to develop computer-based techniques that

minimize or eliminate human intervention in the indexing process. Donna Harman's paper is a concise and lucid survey of automatic indexing strategies, covering topics like stop words, stemming, term weighting, relevance feedback, and phrase indexing. Amy J. Warner has written an equally laudable overview of the use of linguistic information in the retrieval of full-text documents. For nonspecialists interested in quickly understanding these inherently complex topics, these papers are real gems.

Overall, *Challenges in Indexing Electronic Text and Images* is a commendable work that includes contributions by noted experts. It is more oriented toward information scientists than library practitioners; however, it has a good selection of papers that academic librarians may find of interest, and it is recommended for readers with a serious interest in indexing topics.—*Charles W. Bailey, Jr., University of Houston, Houston, Texas.*

Les Bibliothèques dans l'université. Ed. Daniel Renoult. Paris: Editions du Cercle de la Librairie, 1994. 358p. (ISBN 2-7654-0548-4).

France is the birthplace of networked information for the general public. That country's Minitel, launched in 1982, was the first working system to purvey digitized information to the uninterested user—the user who neither knows nor cares how the system itself works. This general public orientation of the Minitel was a harbinger of things to come. These now are arriving with a vengeance for the U.S. Internet. Libraries in France, as elsewhere, have been heavily involved in networked information: in Minitel, in the Internet, in BITNET and JANET, and other "nets." And yet university libraries, which have been in the forefront of networked information in the United States and the United Kingdom, have been badly behind in France. This has been not so much from conscious design or difference of approach. It has been more the result of historical circumstances: political, social, financial. These have been in some respects uniquely French; but in other respects they have been distressingly evocative of problems now faced, increasingly, by university libraries in the United States and elsewhere. So Daniel Renoult's book—a tightly drawn compilation of essays by leading thinkers from France and other European countries—can provide background indispensable for understanding both the current general travails of French university libraries and a few of the problems now dawning for university libraries in the United States and elsewhere, in networking and other areas.

The book offers six sections: (1) a superb recent history of French university libraries by the able current inspector-general of French libraries, Denis Pallier; (2) a description of the modern context of the French university and of its information service, both library and nonlibrary by Pierre Carbone; (3) an analysis of the user community, both university and general public, by Renoult himself (he directs planning for the Bibliothèque Nationale de France) and Maggy Péyeril of Montpellier's library; (4) a description of French library infrastructure—organization, buildings, administration, classification, personnel—in essays by several authors, with descriptions of library service approaches which to foreigners can sound both familiar ("Computerization Is under Way") and endearingly French ("La Fonction Patrimoniale"); (5) a section on networking giving the French approach to dealing with what every librarian elsewhere knows, that computers and the information that they offer are here to stay, and that they must and may be dealt with effectively and even happily; and, finally, (6) a foreign, comparative perspective, including (a) an introspective essay on Germany by Gernot Gable of Cologne, (b) a wistful, "grass is always greener" report on a tour of modern German library buildings by the French librarian Marie-France Bisbrouck, (c) a startlingly bleak current assessment of university libraries in the United Kingdom, by Derek Law (King's College, London), and (d) an optimistic and encouraging account of a Dutch approach so successful that it

is being adopted beyond Dutch frontiers by PICA's Look Costers.

At a time when universities themselves are expanding, Renoult argues, one must ask what parallel future their libraries will pursue. (An American remembers the 1992 ARL study, *University Library and Scholarly Communication*, which highlighted the relative decline in libraries' presence on U.S. campuses.) Renoult resists the technological panacea often embraced by financially strapped libraries: "messianic technology," he says, is no substitute for the collective action represented by library service and indeed by a university as a whole. Library missions must change to keep up with changes in the universities that they serve. In France, Renoult believes, this will result in three principal models going forward: (1) the "main" academic library, containing vast multidisciplinary collections serving humanities and social sciences in large and ancient universities; (2) the "center with satellites," a model evolved since the 1960s to keep up with fragmentation in the traditional university's structure—a model that finds it difficult to cope with independent user-organized libraries, Renoult says; and (3) "dispersed documentation," in which each independent research center collects its own materials and provides its own information services, a model used in higher research that most closely follows the "balkanization of specialties and diplomas" on campus. The most general model, Renoult suggests interestingly, is coming to be that of a "network" as opposed to a "hierarchy"; perhaps, one is tempted to add, "like everything else."

An outstanding characteristic of the current changes, Renoult says, is "direct service to the users." OPACs, document delivery, multimedia databases, desktop computer dial-in access, the Internet: these—and the involvement in them already of libraries, of networks like RLIN and OCLC, and of vendors like Blackwell and EBSCO—are among the most significant recent developments. Renoult warns that although universal bibliography might be alive, with the complexity and complementarity that can be achieved with the new techniques, universal access is still far out of reach: our continuing inability to obtain and assimilate information still calls for organization, international cooperation, and, as always—he evokes the names of historians H-J. Martin and Lucien Febvre—for libraries.

The excellent bibliography is limited to printed resources: sad, considering the large and rapidly increasing body of online resources on the subject available to both foreign and French readers. There also is an index of acronyms, indispensable for any non-European reader ("How can one govern a community composed of a dozen nations, without acronyms?"). The book is easily read: its language is nontechnical and is unlikely to tax anyone's French seriously. There are interesting maps by Nancy Dupont, depicting various recent statistics. The book provides a general, comparative, and thoughtful understanding of the current situation of university libraries in France, and, more generally, of academic libraries everywhere, as they encounter problems of political, financial, demographic, and computer origin. It is highly recommended.—*Jack Kessler, kessler@well.sf.ca.us.*

Crews, Kenneth D. *Copyright, Fair Use, and the Challenge for Universities: Promoting the Progress of Higher Education.* Chicago: Univ. of Chicago Pr., 1993. 256p. $22.50 (ISBN 0-226-12055-4).

Ten years, or even five years ago, the topic of copyright was a giant yawn. At learned and professional society meetings, the word assured a sparsely populated session attended only by those who had some connection to managing publishing rights and permissions or by lawyers specializing in copyright. Not so now. Copyright on a program electrifies the conference, and the meeting room is likely to host an overflow crowd.

In the world of big business, communications carriers bid sums higher than any princely ransom for companies that own content, that is, that hold a full hand of copyright cards. The 1993 dogfight

between QVC and Viacom for Paramount epitomized Content as King. Academics, too, are making their voices heard in the fray. Crews' book is one of a cluster of writings (books, electronic manifestos, and national task force reports) that have encouraged faculty, administrators, and librarians to become more aware of the implications of the U.S. Copyright Act for education, for libraries, and for the citizenry.

For starters, Crews offers overarching perspectives on the relationship of copying to the university missions of teaching, research, and information dissemination (libraries). He then discusses rights of copyright owners and of users under the law, the purpose of fair use (which provides the balance between the economic and artistic rights of creators, and the needs of citizens, including students and teachers, to use copyrighted works for societal good), and significant cases related to fair use boundaries (mainly course-pack cases).

The 1976 act was the first to codify the special fair use rights of the reader, without which we could no longer imagine our learning, scholarship, and teaching. After the 1976 act became law, librarians were among the first on campuses to begin to use it and call attention to it. Faculty noticed possibly that not all photocopying at all times could automatically be supplied in the desired quantity. In accordance with Section 108, photocopiers in libraries began to carry signs reminding users of copyright responsibilities.

Litigation has also taught academe about the value of copyrights. The celebrated 1982 NYU course-pack case, settled out of court, slapped the wrists of university copy shops and faculty for not appreciating the economic value of publishers' copyrights. A far bigger splash was caused by the favorable ruling to publishers in the celebrated Kinko's case of 1991. Currently, the library and research communities await further word on the Texaco case, which hinges on whether copying by researchers in a commercial organization is "transformative" use and whether it is fair use.

Central to the book is Crews' assessment of 183 copyright policies from ninety-eight universities, policies that (he believes) demonstrate insufficient understanding of copyright law and copyright practices on campus. He discovers that too few members of the university are involved in creating policies, that policy writers deal with new media poorly, and that they are strongly influenced—in a conservative direction—by concerns about litigation.

One may quietly wish (as this reviewer did) that the book tackled a fuller range of copyright matters—not only copying but also owning and transferring intellectual property created in universities—and that its coverage ranged into 1990s issues of new technologies and the increasingly broadly based discussions about fair use in an age of electrons (CDs, networks, multimedia). For the most part, the book is silent in these areas. We must now encourage Crews, or others as capable and cogent, to give us an equally instructive book that addresses pressing new issues of electronic information.

Why is a companion book so important? Beginning in the 1980s, our academic libraries began to negotiate licenses for electronic "products" that open up access to the campus member's desktop while closing off access to users outside this community. Library users on one campus might have the networked version of WilsonDisc, the Oxford English Dictionary, or UPI newsfeed. Outsiders might knock at the electronic door but lacking the right IP address or Social Security numbers, they are likely to find themselves without the goodies that their colleagues in similar institutions can use. Users on campuses with licenses log on to their accounts to read the daily news and find this type of formidable opening statement: "Unauthorized reading of this file is not permitted. Please report violations to reward@clarinet.com." Through developments in technology, we have the ability to read and move information around, but are everywhere warned that we should not do what seems to come so naturally.

Increasingly, academics want, indeed expect, desktop access to all kinds of information but, of course, librarians are not sure that we can offer wide access to works beyond those in the public domain. We can sense that the new power and the old resistance will be at odds with each other for some time. How do we write policies to use and manage copyright in academia during our transitional time? Ultimately, just what *is* the future of copyright? Two points are of surpassing importance, and these are the basis of Crews' book. First and simply, that colleges and universities and their members know what their intellectual property policies are; second, that they have policies and enunciate them clearly, so that when change occurs it can happen in an orderly fashion.

The book's 136 pages are written accessibly and can be read with much practical benefit by anyone in academia. The forty pages of notes are rich in links (albeit "traditional" print on paper links!) to related documents, and the appendixes pull together various model copying policies, and legal guidelines in one easy place. Those who want to understand how colleges and universities could make a start on crafting better copyright policies or want to start or participate in such a process, have a natural starting place in this book.—*Ann Okerson, Association of Research Libraries, Washington, D.C.*

Willinsky, John. *Empire of Words: The Reign of the OED.* Princeton, N.J.: Princeton Univ. Pr., 1994. 258p. alk.paper, $22.95 (ISBN 0-691-03719-1).

Two strands of scholarly inquiry are interwoven here: the familiar revisionism that reexamines events and sources for the overlooked contributions of the people and the perhaps less familiar concern with the politics of citation, to construe "politics" in its wider sense. To readers wanting background on that latter approach, this reviewer recommends Vladimir Nabokov's playful celebration in *Pale Fire* (1962) and the papers of the scholarly colloquium convened and edited by Stephen A. Barney, *Annotation and Its Texts* (1991).

In applying these approaches to the original *Oxford English Dictionary* (*OED*), its four- volume supplement, and its second edition, Willinsky makes a close and critical examination of the sources of the illustrative quotations used to support the definitions; and he finds those sources unsatisfactory. The author, who is professor and director of the University of British Columbia's Centre for the Study of Curriculum, disavows iconoclasm: "My aim . . . is not to spoil the pleasures of visiting this fascinating castle of the English language." His concern is with the *OED's* "editorial process of culling citation, and the language it constructs with the writer at its center." Most of all, he is interested in the "areas of less than adequate coverage, most notably of women, Commonwealth, and working-class writers from all levels of literate activity *otherwise covered by the citations* [reviewer's emphasis]." Toward the end of the book he broadens this statement of aim to identify three themes: "micronuances of citation"; "the technological future of meaning-making," thus acknowledging the computerization that now enables such critiques as his; and "the larger context of meaning and history within which the *OED* works. Willinsky had access to current *OED* staff and to internal citation files as well as the published dictionaries; the book includes no technical descriptions of the computerization process or of use of the computerized product, however.

After an introduction, Willinsky writes two chapters of institutional and personal history of the 1888–1928 *OED*. Chapters 8 and 10 resume this sort of history of the supplement (1957–1986) and the second edition (1984–1989), though more focused on the citation process. Five of the other seven chapters scrutinize particular sources of citations: Shakespeare in general; nice citations of *The Taming of the Shrew* to identify and examine different ways in which quotations may be used; the most cited authors and titles Willinsky labels "The Victorian Canon" (two chapters); and the modern authors cited in the supplement. The final two chapters intensify

Willinsky's criticism: "The Sense of Omission" and "A Source of Authority." Appended are statistical tables of cited authors and works, explanatory chapter notes, references list, and index.

Wound through all chapters are larger questions. Gender, class, and imperialist considerations aside, what is the effect of preferring *belles lettres* to more workaday prose for so many citations? (Willinsky does say that, "Undoubtedly, only a relatively small number of additional words and senses will be located through a consultation of these additional sources.") What is the effect of using other dictionaries and reference sources, including the electronic? (To the availability of nineteenth-century Shakespeare concordances is attributed some of the bard's citational prominence; to online American newspapers, growing American influence.)

Most problematic is the old question about the prescriptive/descriptive role of dictionaries, and here Willinsky seems to be in some conflict. He wants the *OED*'s base of quotations broadened, yet he backs away from his charge of narrowness: ". . . the dictionary has privileged the literary construction of the language, but it has done so, in comparison to other lexicographical works, with a far greater regard for a broader history of English publishing activity." One might assume his support for nonjudgmental broadening of vocabulary and usage also, but he makes a redemptive call for "correctness," saying, ". . . others (myself included) . . . hold that 'the doctrine of correctness'. . . is now a necessary function of modern communication. . . ." This is a difficult fence to sit.

Perhaps he best sums up his difficulties midway through a long section on the anti-Semitism of writers quoted in the supplement's definition of the word *Jew*: "I do not drag out these citations in order to ask that they by purged and the dictionary rewritten around what are, after all, common enough expressions. But I do ask that we continue to read the work in light of the tension between its descriptive and affirmative functions of citation and definition." In the end, his call is primarily for transparency: "It seems incumbent upon a dictionary of scholarly and historical principles to make the pattern of its coverage—the favored sources, the national distributions—better known to its readers."

It would be nice could one report that a book on such a topic had itself been flawlessly written, edited, referenced, and indexed. Unfortunately, this is not the case. The facade of a handsome book design masks editorial absence and bibliographic and indexing caprice. In the text, besides too many typos, misspelled names, and missing or mistakenly interpolated words, there are solecisms surprising from a writer with Willinsky's credentials. And as one reads, it is simply impossible to predict what name, title, or significant statement on the page will appear in the list of references or the index. Both need headnotes, but no note could make sense of what exists. It is especially ironic in a work that points an accusing finger at the *OED*'s treatment of women to find Elizabeth Gaskell renamed "Jane" and "a Miss Lees of Sidlow" not indexed at all, although she is described in some detail as a diligent reader and supplier of quotations for the *OED*. Male readers equally vaguely named and no more fully described are indexed, e.g., "The Reverend Pierson" and "Dr. Helwich of Vienna."

The index is almost wholly limited to names and to words whose "*OED* definition is discussed in the text." The few attempts at subject indexing are misleadingly incomplete and inconsistent. For example, most but not all mentions of Scottish influence on the *OED* are indexed—under "Scotland"; but for similar information about the United States, one must find the heading "American English" subsumed under the entry "Supplement to the Oxford English Dictionary." And this very incomplete list of page numbers misses many of the most intriguing mentions of American influences, including the statement that Americans' mismanagement of their reading assignment for the original *OED* accounts for the underrepresentation of the eighteenth century in citations.

Complaints about the production aside—and it may be read as a tribute to the stirring effect of Willinsky's assertions that the failure of the index to aid their recall seems so dreadful—this is a book to make all readers think deeply and differently about all dictionaries, those staples of all library reference collections. Worries about dictionaries' citations are not new: Sidney Landau identified similar problems with *Webster's Third New International Dictionary* in his *Dictionaries: The Art and Craft of Lexicography* (1984). But the authority of Willinsky's target dictionary and the opportunities for its revision that computerization brings make it important that his critique be read and discussed.—*Virginia Clark, formerly with* CHOICE, *Middletown, Connecticut.*

Westerman, R. C. *Fieldwork in the Library: A Guide to Research in Anthropology and Related Area Studies.* Chicago: ALA, 1994. 357p., paper, $45 (ISBN 0-38389-0632-X).

Anthropology covers an enormous range of subject matter, from specific area studies to linguistics, archaeology, prehistory, primatology, and biological anthropology. Not surprisingly, the discipline has produced a vast literature scattered among several floors of any academic library. R. C. Westerman has done a great service to the discipline by gathering and organizing in a single volume a kind of superreference book on anthropology.

Fieldwork in the Library is not a source book on primary anthropological literature. It is a well-annotated guide to all kinds of reference materials for anthropologists: bibliographies, handbooks, review journals, dictionaries, and encyclopedias. It even discusses selected computer databases and listservs that cater to anthropological researchers.

The book is divided into two large sections. Part I organizes references by discipline and subdiscipline, which here means chapters dealing with archaeology and prehistory, ethnology and cultural anthropology, and anthropological linguistics and biological anthropology. Part II comprises five chapters surveying reference resources on the major ethnographic areas studied by anthropologists. Separate chapters deal with resources on Sub-Saharan Africa, the Americas, Asia and the Pacific, and Europe and the successor countries of the former Soviet Union. There is a separate chapter devoted to what Westerman calls "Islamic influence and Israel." This chapter organizes materials on Israel and all the Islamic societies in the Mideast, North Africa, Central Asia, and Southeast Asia. This classification is not logically parallel to the other ethnographic areas, based as it is on religion rather than geography. Despite the inconsistency, the information presented is thorough and potentially quite useful for librarians and scholars.

There are, of course, the usual minor omissions and errors that one would expect in such a wide-ranging work. In the field of Oceanic ethnology, for instance, it was surprising to find no reference to *Pacific Studies*, which publishes significant book reviews and has a very lively and successful book review forum in which several scholars review major works and the authors of these works respond. Westerman also appears to have confused a Solomon Island bibliography with a Samoan Island bibliography (p. 275).

Chapter 1, "What Every Anthropologist Needs to Know," is a highly condensed minicourse on the range of research needs of anthropology students. It is actually intended for librarians with a limited knowledge of anthropology. This chapter introduces the organizational framework used in all the other chapters. It begins with an annotated list of general bibliographic guides, then goes on to describe current research materials such as review journals and selected scholarly journals. There are sections on "retrospective bibliographies" (a term few anthropologists understand), continuing indexes, encyclopedias, compendiums, and dictionaries, state-of-the-art reviews, and directories to anthropological organizations. Separate sections in each chapter

review available sources on graphic materials, electronic sources of information, and archives of unpublished materials such as dissertations.

From an anthropologist's perspective, this book is impressive for the enormous amount of work and care that went into it, yet also disappointing in its relative inaccessibility to anthropologists. In a sense, this criticism is not fair to the author's intentions. Though ALA is marketing the book as a research tool for anthropologists, the author makes it clear that the intended audience is really reference librarians who need to advise students and scholars undertaking library research. The book's introduction contains extended technical discussions of classification principles used in the book—discussions obviously meant for the librarian rather than the anthropologist. The framework of headings common to all chapters undoubtedly makes the book easier to use for reference librarians. However, this work will probably not end up finding a home on the bookshelves of many students of anthropology.

The lack of a subject index in the book is inexplicable. Finding bibliographic sources on particular ethnographic areas is relatively painless, given the book's ethnographic area focus. But locating specific references on specific areas of any subfield (e.g., medical anthropology, psychological anthropology, dental anthropology or tomography) requires a careful reading through the relevant subfield chapter in the hope of hitting upon a relevant reference. Yet it is precisely in terms of such specific subtopics that anthropologists pursue their research. The author is more concerned with bibliographers' categories than with those used by anthropologists themselves. A future edition of this book should certainly include a carefully constructed subject index, an addition that would make this book a truly invaluable resource for the professional anthropologist as well as the reference librarian.

As it stands, *Fieldwork in the Library* contains an impressive array of references that are potentially of great utility for anthropology students at all levels of sophistication. But this is a book designed to be read rather than consulted. It is written in a highly discursive style that makes it less of a ready reference book than a thoughtful treatise on doing research in anthropology. As such, anyone planning to use the book would be advised to read through the introduction and the first two chapters to get a sense of how to use the book. Then the reader will be free to turn to relevant specific chapters, but these too should be read with some care rather than simply consulted. Anthropologists have far more reference resources available to them than most of them realize. Those willing to learn the language and culture of the professional bibliographer will be well rewarded by Westerman's exhaustive and thoughtful compilation.—*Bradd Shore, Emory University, Atlanta, Georgia.*

McDonald, Joseph A., and Lynda Basney Micikas. *Academic Libraries: The Dimensions of Their Effectiveness.* Westport, Conn.: Greenwood, 1994. 188p., alk. paper, $49.95 (ISBN 0-313-27269-7).

In this volume, which examines the construct of *library effectiveness*, the authors address three major questions: (1) Is it possible to establish criteria for assessing academic library organizational effectiveness? (2) Can dimensions of academic library organizational effectiveness be identified? (3) Can groups of academic libraries be identified that show high effectiveness in contrast with others which show lower effectiveness?

The data used to answer these questions come from a questionnaire sent to all academic libraries in the 264 institutions without doctoral programs in six Middle Atlantic states and the District of Columbia. The response averaged three questionnaires per institution and represented 131 institutions. The intent of the questionnaire was to measure the trait indicators of effectiveness as perceived by library decision makers at these institutions.

This research builds on Kim S. Cameron's work, which has attempted to define a construct of organizational

effectiveness. The book includes a useful review of the concept of the effectiveness of academic libraries and the measures and models developed by earlier authors. It is fair to say that most library administrators, when confronted with the question of the effectiveness of their organization, think in terms of a set of one or more criteria (e.g., document exposure, number of volumes in the collection or added within a given time, or reference transactions successfully completed).

The value of McDonald and Micikas' research is the expansion of the concept of effectiveness into a multivariate and multidimensional construct. Acknowledging that "at its heart, effectiveness is an intensely practical matter," the authors state, "if a measuring device must be as complex as the phenomenon it is measuring, multiple indicators of effectiveness are essential."

Following Cameron, McDonald and Micikas define effectiveness as successful organizational transactions and study it from the perspective of the "dominant coalition" (i.e., the library decision makers) because they are the major users of data relating to organizational effectiveness and ultimately determine an organization's effectiveness. By itself, the definition of effectiveness as successful organizational transactions is not meaningful or useful. To grasp the value of this research, one must understand the concept of effectiveness as a construct whose validity will always fall short of reality, but which may be developed for each organization by careful attention to organizational goals. It requires visualizing the library as an entire organizational entity whose processes and products contribute holistically to the fulfillment of its unique and continually changing mission.

The research identified twenty-one factors, or groupings of variables, which in turn were subjected to factor analysis revealing four factors or *domains*: major resources, services, library/stakeholder interactions, and access. For example, the dimensions associated with major resources are staff size and diversity, college support for the library, and library collection adequacy. The dimensions associated with services are access/use of outside libraries, cooperative associations, and the availability of librarian professional services.

The authors believe that they have identified libraries with high effectiveness by asking the respondents whether their libraries are effective. This assumption is questionable at best. While it is true that the "dominant coalition" may understand best the resource allocation and goals of the organization, to present a set of criteria as measuring organizational success which include no attempt to directly determine the satisfaction of the customers of the organization is to ignore, at the organization's peril, the very focus of its efforts. It belies the sense of complexity which the methodology attempts to illuminate and diminishes the usefulness of the research.

The volume is schizophrenic in its construction. The first seven chapters report on the survey research. The final two chapters, "The Grail of Library Goodness" and "Libraries and Information," seem to constitute a different work entirely. Both parts of the book are interesting, but the relationship between them seems tenuous at best and there is little real discussion of the application of the research to the questions raised in the final chapters. Instead, in these two chapters the authors struggle with the mission of the academic library and acknowledge the shift from the provision of information to the education of the user.

The construction of the survey and the answers of the respondents reflect the conservative view of academic librarianship concerned with the provision of services, the flow of resources into the library, and the development of the collections. These concerns still constitute important elements of library effectiveness, but the organizations' goals are shifting in the information age. McDonald and Micikas believe that an institution-specific dimensionalized model of effectiveness is "likely to be a much more successful one . . . than the historic univariate or multivariate static models [because] it allows each information

organization to be seen as effective in relationship to the strategic choices it or its host institution may have made." They conclude, in contrast to their coalition, "the only effectiveness criterion that truly matters is the developed, educated student. Without successful students, successful libraries are meaningless." Such a conclusion raises the obvious question that the authors do not address—how to expand the criteria of academic library effectiveness to include measures of its contribution toward the education of the student.

The book does not intend to be a hands-on volume to assist libraries in measuring their performance. *Measuring Academic Library Performance: A Practical Approach*, by Nancy A. Van House, Beth T. Weil, and Charles R. McClure, with its focus on objective output measures and its ease of use, will continue to be the book of choice for academic libraries assessing their own performance. The value of McDonald and Micikas' research is in the development of the concept of library effectiveness in the broader context of a mental construct that goes beyond the combination of scores on univariate performance measures.—*Maxine H. Reneker, Naval Postgraduate School, Monterey, California.*

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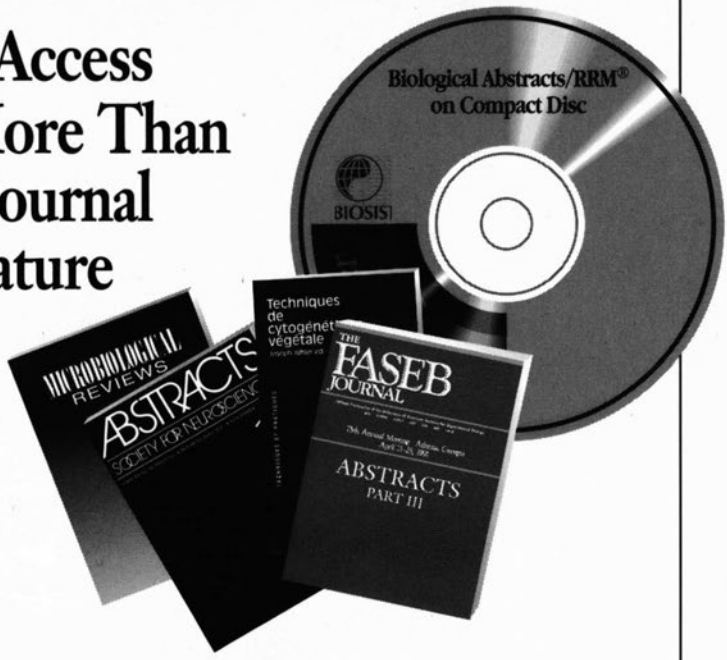

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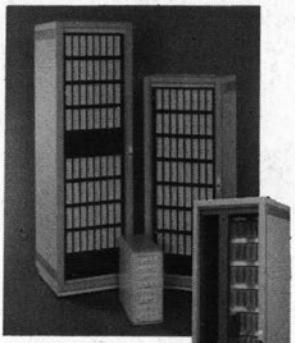

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